

Errata

Title & Document Type: 197B Oscilloscope Camera Operating and Service Manual

Manual Part Number: 00197-90919

Revision Date: March 1981

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, life sciences, and chemical analysis businesses are now part of Agilent Technologies. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A. We have made no changes to this manual copy.

Support for Your Product

Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

www.agilent.com

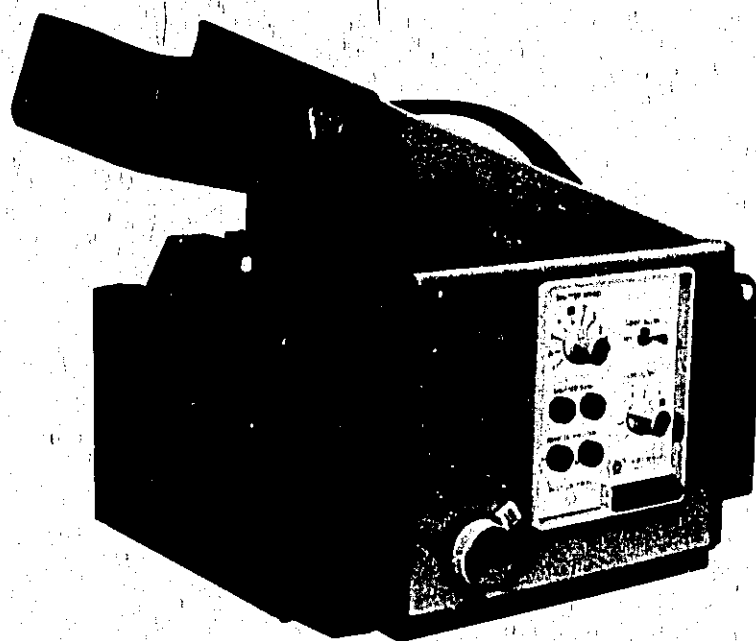
Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.



Agilent Technologies

O P E R A T I N G A N D S E R V I C E M A N U A L

197B OSCILLOSCOPE CAMERA

 **HEWLETT
PACKARD**

HP 197B

SAFETY

This product has been designed and tested according to International Safety Requirements. To ensure safe operation and to keep the product safe, the information, cautions, and warnings in this manual must be heeded. Refer to Section I and the Safety Summary for general safety considerations applicable to this product.

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. However, warranty service for products installed by HP and certain other products designated by HP will be performed at Buyer's facility at no charge within the HP service travel area. Outside HP service travel areas, warranty service will be performed at Buyer's facility only upon HP's prior agreement and Buyer shall pay HP's round trip travel expenses.

For products returned to HP for warranty service, Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.



OPERATING AND SERVICE MANUAL

MODEL 197B OSCILLOSCOPE CAMERA

(Including Options 001, 002, 003, 006, and 007)

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1905A.

For additional important information about serial numbers, see INSTRUMENT AND MANUAL IDENTIFICATION in Section I.

G. PHILLIPS
R. KLOSTERBJER
J. SCHEETZ
C. FOX

COPYRIGHT HEWLETT-PACKARD COMPANY/COLORADO SPRINGS DIVISION 1980
1900 GARDEN OF THE GODS ROAD, COLORADO SPRINGS, COLORADO, U.S.A.

ALL RIGHTS RESERVED

Manual Part Number 00197-90919
Microfiche Part Number 00197-90819

PRINTED: MARCH 1981

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT.

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a prewired power cable. The power cable must either be plugged into an approved three contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

DANGEROUS PROCEDURE WARNINGS.

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

WARNING

**Dangerous voltages, capable of causing death, are present in this instrument.
Use extreme caution when handling, testing, and adjusting.**

TABLE OF CONTENTS

Section	Page	Section	Page
I GENERAL INFORMATION	1-1	3-33. Remote Shutter and Shutter Synchronization	3-6
1-1. Introduction	1-1	3-35. External Graticule Considerations	3-6
1-4. Characteristics	1-1	3-37. Parallax	3-6
1-6. Safety Consideration	1-1	3-39. Depth-of-field	3-7
1-8. Description	1-1	IV PERFORMANCE CHECK	4-1
1-10. Accessories Supplied	1-1	4-1. Introduction	4-1
1-12. Accessories Available	1-2	4-3. Performance Check	4-1
1-14. Options	1-2	4-5. Shutter Operation	4-1
1-16. Instruments Covered by Manual	1-2	4-6. Light Leakage	4-1
II INSTALLATION	2-1	V ADJUSTMENTS	5-1
2-1. Introduction	2-1	5-1. Introduction	5-1
2-3. Initial Inspection	2-1	5-3. Safety Requirements	5-1
2-5. Preparation for Use	2-1	5-5. Adjustments	5-1
2-6. Power Requirements	2-1	VI REPLACEMENT PARTS	6-1
2-7. AC Line Voltage Selection	2-1	6-1. Introduction	6-1
2-8. AC Power Cable	2-2	6-3. Abbreviations	6-1
2-9. Operation and Storage Environments	2-2	6-5. Replaceable Parts List	6-1
2-10. Mounting Instructions	2-2	6-7. Ordering Information	6-1
2-12. Mounting Instructions for Option 002	2-4	6-10. Spare Parts Kit	6-1
2-15. Mounting Instructions for Option 006	2-5	6-12. Direct Mail Order System	6-1
2-17. Storage and Shipment	2-5	VII MANUAL CHANGES	7-1
2-19. Other Packaging	2-5	7-1. Introduction	7-1
III OPERATION	3-1	VIII SERVICE	8-1
3-1. Introduction	3-1	8-1. Introduction	8-1
3-3. Camera Controls	3-1	8-4. Theory of Operation	8-1
3-5. Viewer Lever	3-1	8-6. Troubleshooting	8-1
3-6. Shutter Sync Jacks	3-1	8-9. Preventive Maintenance	8-1
3-7. Shutter Speed Switch	3-1	8-11. Mechanical Inspection	8-1
3-8. Lens f/No. Control	3-1	8-14. Switch Maintenance	8-1
3-9. Remote Shutter Jacks	3-2	8-15. Camera Back Cleaning	8-1
3-10. Object-to-Image Ratio Adjustment	3-2	8-16. Lens Cleaning	8-1
3-11. Shutter Open Light	3-2	8-17. Lubrication	8-3
3-12. Graticule Illumination	3-2	8-18. Repair and Replacement	8-3
3-13. Photographic Films	3-2	8-20. Side Panel Access	8-3
3-19. CRT Phosphor	3-2	8-21. Shutter Blade Removal Procedure	8-3
3-22. Operating Procedures	3-2	8-22. Servicing Etched Circuit Boards	8-5
3-23. General Considerations	3-2	8-24. Print Quality Improvement	8-5
3-27. Focus	3-3	8-26. Light Leakage	8-5
3-28. Recurrent Sweep Exposures	3-4		
3-30. Single Sweep Exposure	3-5		
3-32. Object-to-Image Ratio Adjustment	3-6		

TABLE OF CONTENTS (Cont'd)

Section	Page	Section	Page
8-27. Fogging.....	8-5	8-33. Camera Back	8-6
8-30. Film Tearing.....	8-6	8-34. Lens Assembly.....	8-7
8-31. Print Imperfections	8-6	8-35. Block Diagram Description	8-7
8-32. General Instrument Description ...	8-6	8-36. Service Sheet 1, Detailed Circuit Descriptions	8-8

LIST OF ILLUSTRATIONS

Figure	Title	Page	Figure	Title	Page
2-1. Camera Power Panel	2-1	6-4. Camera Internal Exploded View	6-6		
2-2. Power Cable and Mains Plug Part Numbers	2-2	6-5. A. Option 006 Bezel Exploded View B. Option 002 Bezel Exploded View	6-7		
2-3. Camera Front View	2-3				
2-4. Option 002 Camera Front View	2-4				
2-5. Option 006 Camera Front View	2-5	8-1. Right-hand Cover Removal	8-4		
		8-2. Left-hand Cover Removal	8-4		
3-0. All Exterior Camera Views	3-0	8-3. Internal Access	8-5		
3-1. Camera Control Panel	3-1	8-4. Camera Back Operation	8-6		
3-2. Camera Back	3-4	8-5. 197B Block Diagram	8-7		
3-3. A. Waveform Out of Focus B. Waveform In Focus	3-5	8-6. A1 Component Locator	8-8		
3-4. Parallax Effects	3-7	8-7. A2 Component Locator	8-8		
		8-8. A3 Component Locator	8-8		
6-1. Model 197B Exploded View	6-3	8-9. Service Sheet 1, Model 197B Schematic	8-9		
6-2. Camera Control Panel Exploded View	6-4	8-10. A1 Component Locator (Option 001) ...	8-10		
6-3. Camera Power Panel and Hood Exploded View	6-5	8-11. A2 Component Locator (Option 001) ...	8-10		
		8-12. Model 197B (Option 001) Schematic ...	8-11		
		8-13. All Exterior Camera Views	8-13		

LIST OF TABLES

Table	Title	Page	Table	Title	Page
1-1. Model 197B Operating Characteristics ..	1-1	6-1. Reference Designators and Abbreviations	6-2		
1-2. Camera/Bezel Adapter	1-3	6-2. Replaceable Parts	6-8		
		6-3. List of Manufacturer's Codes	6-13		
2-1. Environmental Limits	2-3				
3-1. Polaroid Film Selection	3-3	8-1. Schematic Notes	8-2		
		8-2. Camera Lubrication Points	8-3		

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This operating and service manual contains information which assists in the operation, maintenance, and performance evaluation and adjustment of the Model 197B Oscilloscope Camera.

1-3. Listed on the title page (i) of this manual is a microfiche part number. This number can be used to order 102 x 152 mm (4 x 6 inch) microfilm transparencies of the manual. Each microfiche contains up to 96 photoduplicates of manual pages. The microfiche package also includes the latest manual change supplement as well as pertinent service notes.

1-4. CHARACTERISTICS.

1-5. Operating characteristics of the Model 197B are listed in table 1-1. Any changes to these characteristics due to manufacturing or design changes will be listed on a manual change sheet included with this manual.

1-6. SAFETY CONSIDERATION.

WARNING

To prevent personal injury, observe all safety precautions and warnings stated on the instrument and in this manual.

1-7. This product is a Safety Class 1 instrument (provided with a protective earth terminal). Review the instrument and manual for safety markings and instructions before operation. Specific warnings, cautions, and instructions are placed wherever applicable throughout this manual. Refer to the Safety Summary in the front of this manual and to Sections II and III for further safety precautions. These precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates the safety standard of design, manufacture, and intended use of this instrument. Hewlett-Packard assumes no liability for the customer's failure to comply with these requirements.

1-8. DESCRIPTION.

1-9. The HP Model 197B Camera is an instrument that is used to photograph cathode-ray tube screens. The 197B camera can be adapted to most cathode-ray tube displays with the adapters available from Hewlett-

Table 1-1. Model 197B Operating Characteristics

REDUCTION RATIO: continuously adjustable from 1:1 to 1:0.7. Reference scale provided on focus plate.
LENS: 75 mm, f/1.9 high transmission lens; aperture range, f/1.9 to f/16.
SHUTTER SPEEDS: 1/30, 1/15, 1/8, 1/4, 1/2, 1, 2, 4 seconds, Time and Bulb; shutter has a sync contact closure output for triggering external equipment and an input jack for remote operation.
SHUTTER SYNC: contacts rated for 100 V max and 100 mA max.
CAMERA BACK: 83 x 108 mm (3-1/4 x 4-1/4 in.) Polaroid pack back (another back is available, see Options); backs may be interchanged without refocusing.
MOUNTING: list on/off mounting with positive lock, swing-away hinging to left. Standard 10376 A adapter mounts directly on most HP 1700 Series oscilloscopes. Adapters are available to fit other instruments and displays; see 197B camera adapter table. When ordering the 197B with alternative adapters, see Options. The adapters are also offered as Camera Accessories.
VIEWING: low-angle, direct viewing through a flexible face mask.
SHUTTER OPEN INDICATOR: illuminated whenever shutter is open.
ULTRAVIOLET ILLUMINATION: light source and lens filter provides graticule illumination and photographic speed enhancement. Controlled by on/off toggle switch.
FOCUS: adjustable focusing with lock; split image focusing plate provided.
DIMENSIONS: 356 mm (14 in.) long, 267 mm (10-1/2 in.) high, 194 mm (7-5/8 in.) wide.
WEIGHT: net, 4.5 kg (10 lb); shipping, 7.3 kg (16 lb).
POWER: switch selectable 115 V $\pm 10\%$ or 230 Vac $\pm 10\%$, 48 to 66 Hz*, 10 VA max.

*The camera will operate from 48 to 440 Hz, but does not meet the ac line to chassis leakage requirements of UL544 (Medical and Dental) listing above 66 Hz.

Packard. Interchangeable film backs enable you to use a variety of films such as Polaroid® or conventional sheet, pack, or roll film.

1-10. ACCESSORIES SUPPLIED.

1-11. The following accessories are supplied with the 197B:

One Split-image Focus Plate, HP Part No. 1000-0226

One Power cable, HP Part No. 8120-1378

One Operating and Service Manual

® Registered Trademark of Polaroid, Inc.

1-12. ACCESSORIES AVAILABLE.

1-13. The following accessories are available for the Model 197B (See table 1-2 for applications):

Model 10352B	Graflok® 10 × 13 cm (4 × 5 in.) back (Supplied with 197B Option 003).
Model 10353B	Polaroid Land pack-film back (Supplied with standard 197B, but not supplied with Option 003).
Model 10358B	Carrying Case
Model 10367A	Camera bezel adapter which adapts HP 195A, 197A, and 197B Option 002 cameras to model HP182 instruments.
Model 10375A	Camera adapter (Supplied with 197B Option 006).
Model 10376A	Camera adapter for 1700 series oscilloscopes with 8 × 10 div CRT (Supplied with standard 197B, but not supplied with Option 002 or 006).
Model 10378A	Camera adapter (Supplied with 197B Option 002).

1-14. OPTIONS.

1-15. The following options are available for the 197B:

Option 001. Deletes the ultraviolet illumination feature.

Option 002. Replaces the standard Model 10376A camera adapter with the Model 10378A camera adapter.

Option 003. Replaces the standard Model 10353B Polaroid Land-pack film back with the Model 10352B Graflok back.

® Registered Trademark of Graflex, Inc.

Option 006. Replaces the standard Model 10376A camera adapter with the Model 10375A camera adapter.

Option 007. Meets UL 544 listing requirements for medical and dental electronic equipment.

1-16. INSTRUMENTS COVERED BY MANUAL.

1-17. Attached to the instrument is a serial number plate. The serial number is in the form: 0000A00000. It is in two parts; the first four digits and the letter are the serial prefix and the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a change is made to the instrument. The letter in the prefix designates the country in which the instrument was manufactured (A=USA; G=West Germany; J=Japan; S=Singapore). The suffix however, is assigned sequentially and is different for each instrument. The contents of this manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

1-18. An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates the instrument is different from those described in this manual. The manual for this newer instrument is accompanied by a yellow Manual Changes supplement. This supplement contains "change information" that explains how to adapt the manual to the newer instrument.

1-19. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Change supplement. The supplement for this manual is identified with the manual print date and part number, both of which appear on the manual title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-20. For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

Table 1-2. Camera/Bezel Adapter

HP Instruments	CAMERA		
	197B	197B/002	197B/006
HP 5 in. Round CRT's: 120, 122, 130, 132, 140A, 140S, 141A, 141S, 150, 175, 3702A, 8414A, 851B, 852A	10378A	Direct	10378A
HP 5 in. Rectangular CRT's: 1200 Series (not 1220 series), 140B, 140T, 141B, 141T, 1600A, 180, 181, 183, 184, 191A, 193A, 3580A, 3790A, 8412A	10378A	Direct	10378A
182A/C/T	10367A and 10378A	10367A	10367A and 10378A
1332A, 1333A, 1335A, 1336A, 1340A, 1980A/B, 3582A, 3585A, 3725A, 5420A, 8568A, 8566A	10375A	10375A	Direct
1700 Series with 8 × 10 division CRT's	Direct	10376A	10376A

NOTE

1. Cameras and adapters in this table should permit the cameras to physically fit on the listed instruments.
2. For the HP 1715A, HP 1722B, and HP 1725A oscilloscopes, locking plate  can not be installed.
3. If ultraviolet light is filtered on the path to phosphors or reaches phosphors which are not sensitive to ultraviolet light, then the ultraviolet light will not illuminate the graticule. An alternate method to illuminate the graticule is to use internal CRT floodguns.

EXAMPLES:

- A. Phosphors which are not sensitive to ultraviolet light and instruments that have them:

P39 Phosphor HP140T, HP180TR, HP182T

P7 Phosphor HP8412A

- B. A faceplate which filters out ultraviolet light and some instruments that have it:

Lexan Faceplate HP1332A, HP1333A, HP1335A, HP1336A, HP1340A, HP3565A, HP5420A, HP5423A, HP8505A, HP8565A, HP8566A, HP8568A

INSTALLATION

SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section provides installation instructions for the Model 197B Oscilloscope Camera. Also included is information about initial inspection and damage claims, preparation for use, storage, and shipment.

2-3. INITIAL INSPECTION.

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as listed in the "Accessories Supplied" paragraph in Section I. Procedures for checking electrical performance are given in Section IV. If the contents are incomplete, or there is mechanical damage or defect, or the instrument does not pass the Performance Tests, then notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, then notify the carrier as well as the Hewlett-Packard office. Keep the shipping material for carrier's inspection. The HP office will arrange for repair or replacement, at HP's option, without waiting for claim settlement.

2-5. PREPARATION FOR USE.

WARNING

Read the Safety Summary in the front of this manual and the "Safety Considerations" paragraph in Section I before installing or operating this instrument.

2-6. **POWER REQUIREMENTS.** The 197B is powered by an external source of 115 Vac $\pm 10\%$ or 230 Vac $\pm 10\%$ at 48 to 66 Hz* single phase. Maximum power requirement is 10 VA.

*NOTE

The camera will operate from 48 to 440 Hz, but does not meet the ac line to chassis leakage requirements of UL544 (Medical and Dental) listing above 66 Hz.

2-7. AC LINE VOLTAGE SELECTION (See Figure 2-1).

- Disconnect ac input power cord from side panel.
- Set power selector switch on side panel to the proper voltage setting for compatibility with the ac

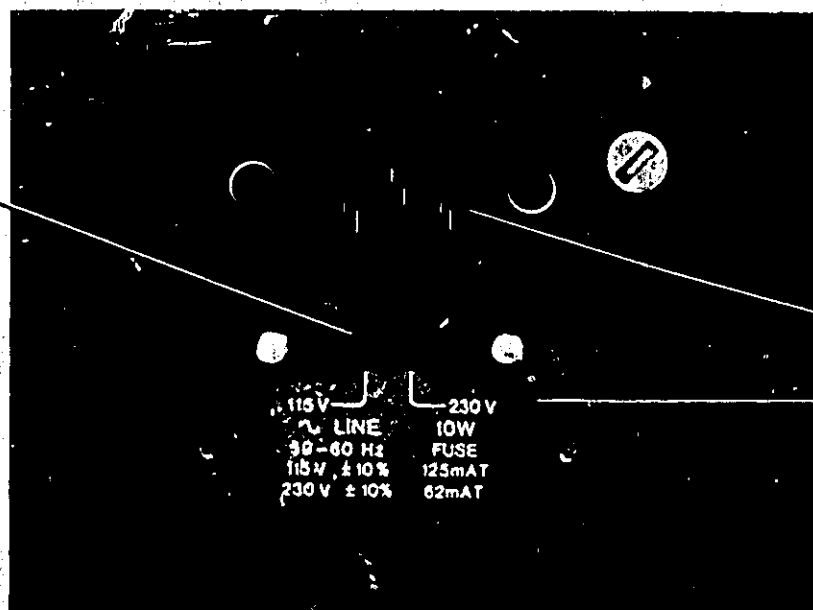


Figure 2-1. Camera Power Panel

Installation

Model 197B

input power source. Refer to side panel label  to match switch position with source voltage.

c. Check the fuse to make sure it is correct for the line voltage used.

d. Connect 197B power cord between the recessed side panel power plug  and the input power receptacle (usually a wall outlet).

2-8. AC POWER CABLE. This instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle this cable grounds the instrument cabinet. The type of power cable plug shipped with each instrument depends on the country of destination. Figure 2-2 lists the corresponding power cable part numbers, option numbers, and receptacle configurations to which these cables mate.

2-9. OPERATION AND STORAGE ENVIRONMENTS. Table 2-1 lists the environmental limitations for operating and storing the Model 197B.

2-10. MOUNTING INSTRUCTIONS (See Figure 2-3).

2-11. The 197B is supplied with the Model 10376A camera adapter  for 1700 series oscilloscopes with an 8 x 10 div CRT. To install the 197B standard camera on a

1700 series oscilloscope with 8 x 10 division CRT, proceed as follows:

a. Remove locking plate  from bottom of adapter by unscrewing captive thumb screw .

b. Hold camera securely and slide adapter over top of oscilloscope CRT camera support so adapter engages mounting grooves on side of CRT bezel support.

NOTE

Locking plate  does not fit on 1715A, 1722B, and 1725A oscilloscopes, but locking plate  does not need to be installed unless:

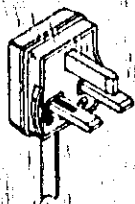
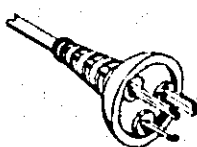
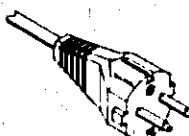
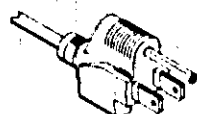
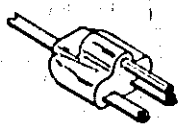
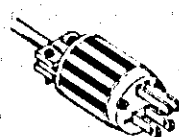
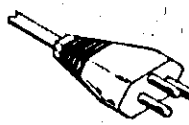
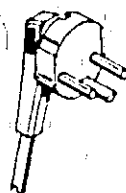
1. Long time exposures are to be made (provides a light seal).

2. The camera must be mechanically secured to the oscilloscope.

c. To reinstall locking plate :

1. Place oscilloscope on rear feet and slide camera slightly away from attenuator knobs.

2. Hold locking plate  against CRT camera support.

Option 900 United Kingdom 250 V  Plug BS 1363A HP 8120-1703	Option 901 Australia/ New Zealand 250 V  Plug NZSS 198/AS C112 HP 8120-0696	Option 902 European Continent 250 V  Plug CEE7-VII HP 8120-1692	Option 903 USA/ Canada 125 V  Plug NEMA 5-15P HP 8120-1521
Option 904 USA/ Canada 250 V  Plug NEMA 6-15P HP 8120-0698	Option 007 Hospital Grade 125V  Plug NEMA 5-15P HP 8120-1992	Option 906 Switzerland  Plug SEV 1011.1959-24507 HP 8120-2296	Option 912 Denmark 220 V  Plug DHCR 107 HP 8120-2956

NOTE: The number listed for the plug is the industry identifier for the plug only. The HP part number specifies a complete power cordset.

Figure 2-2. Power Cable and Mains Plug Part Numbers

Table 2-1. Environmental Limits

Environmental Condition	With film	Without film
Maximum storage temperature	70°C*	75°C
Minimum storage temperature	-30°C	-40°C
Maximum operating temperature	50°C	55°C
Minimum operating temperature	-5°C	-20°C
Altitude:		
Operating	15 000 ft	
Nonoperating	25 000 ft	

Environmental Condition	With film	Without film
Maximum relative humidity		
-5°C to 50°C	90%	
Over 50°C	50%	
25°C to 40°C		95%
CAUTION Avoid extended operation or storage under conditions of high humidity.		

*For a period not to exceed 8 hours.

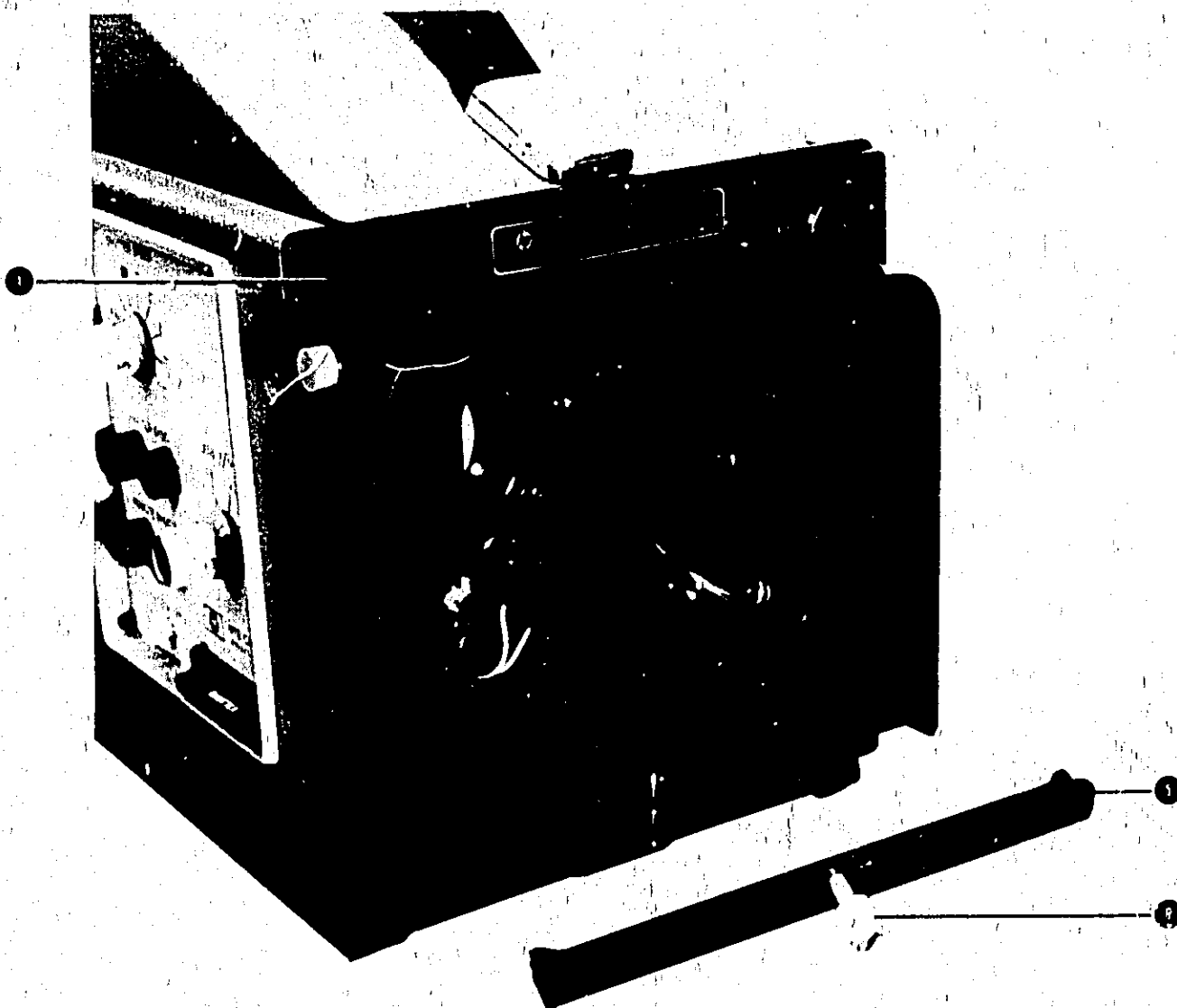


Figure 2-3. Camera Front View

3. Slide camera into position and thread captive screw ⑤ (on locking plate) into 10376A adapter.

4. Tighten captive thumb screw with a screwdriver.

2-12. MOUNTING INSTRUCTIONS FOR OPTION 002.

2-13. The 197B Option 002 Camera is designed to fit all oscilloscopes using the standard 14 cm (5-5/8 in.) diameter bezel, or an 11 × 14 cm (4-1/2 × 5-1/2 in.) rectangular bezel. The mounting frame is designed for 2 cm (3/4 in.) bezel depth, permitting direct attachment to some HP oscilloscopes. Refer to table 1-2 for compatibility information. To mount the camera on a round bezel, see figure 2-4 for identification of parts, then proceed as follows:

a. Adjust mounting lock knob ① so that locking lever ② is positioned approximately as shown in figure 2-4.

b. Mount camera on oscilloscope bezel. Press forward gently on camera until mounting retainers ③ hook over lip at rear of bezel.

NOTE

The light gasket ④ will be compressed slightly by this action, preventing light leakage into the camera.

c. Adjust camera so that camera horizontal axis is parallel with horizontal axis of CRT graticule.

d. Turn lock knob ① clockwise until locking lever is tightened firmly against bezel. Note that lever also locks over lip at rear of bezel.

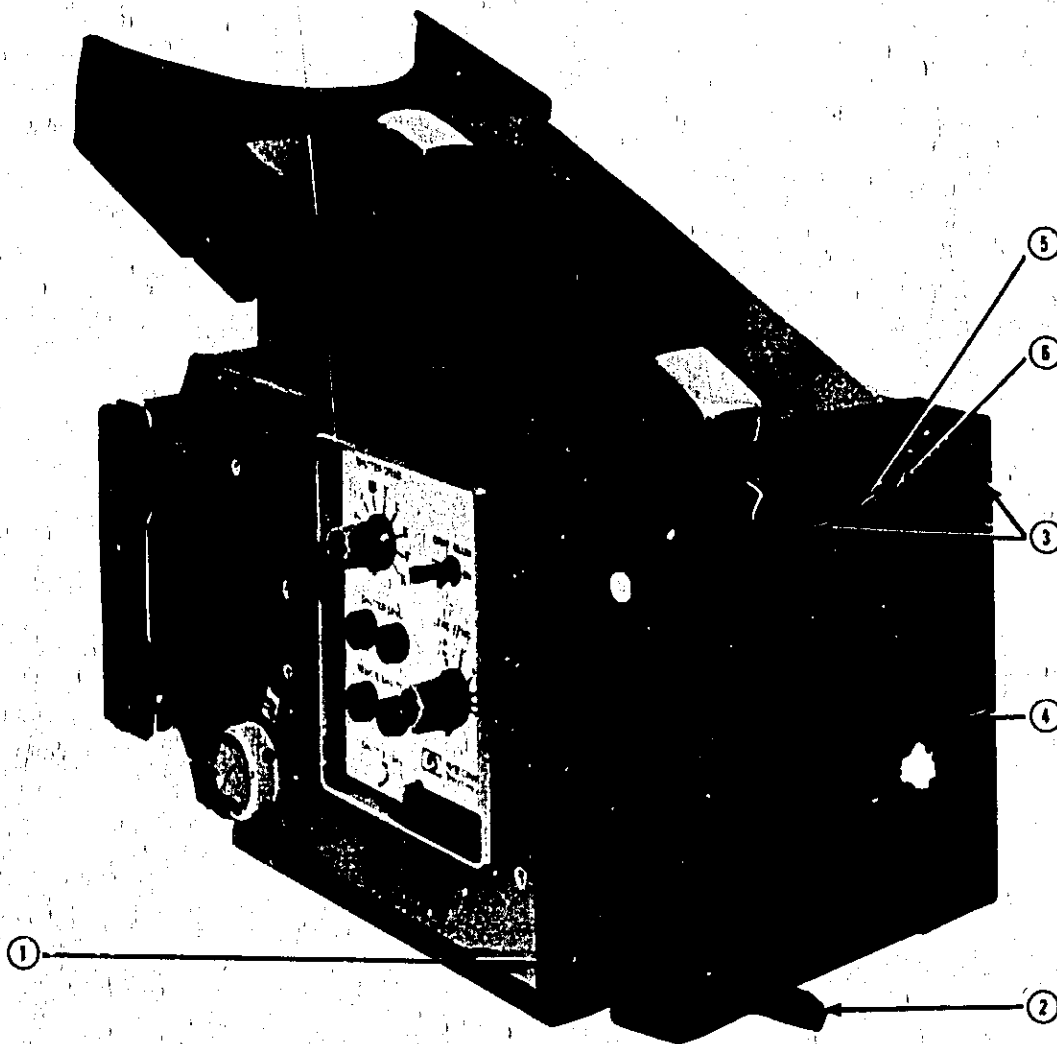


Figure 2-4. Option 002 Camera Front View

2-14. The camera is mounted on a rectangular bezel in the same manner as previously described, except that light gaskets ③ must be repositioned prior to mounting. Reposition the gaskets as follows:

- Loosen two lock screws ① inside mounting frame, one-quarter turn.
- Lower gaskets until lock screws are at lower end of slots.
- Tighten lock screws.

2-15. MOUNTING INSTRUCTIONS FOR OPTION 006.

2-16. To install the Model 197B/006 on an instrument, proceed as follows (See Figure 2-5):

- Loosen adapter bracket screw until bezel bracket drops sufficiently to clear bottom edge of bezel.
- Hold camera securely and place mount retainer of adapter into top camera-mounting bezel groove.

CAUTION

Be certain that retainer is fully seated in top camera-mounting bezel groove.

- Line up bezel bracket with bottom camera-mounting groove, and tighten bezel bracket screw until the Model 197B/006 is locked securely in place on the bezel.

2-17. STORAGE AND SHIPMENT.

2-18. **Original Packaging.** Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

2-19. **Other Packaging.** The following general instructions should be used for repacking with commercially available materials:

- Wrap instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard office or service center, attach tag indicating type of service required, return address, model number, and full serial number.)
- Use a strong shipping container. A double-wall carton made of 350-pound test material is adequate.
- Use a layer of shock-absorbing materials 70 to 100 mm (3 to 4 in.) thick around all sides of the instrument to provide firm cushioning and prevent movement inside container. Protect control panel with cardboard.
- Seal shipping container securely.
- Mark shipping container FRAGILE to ensure careful handling.
- In any correspondence, refer to instrument by model number and full serial number.

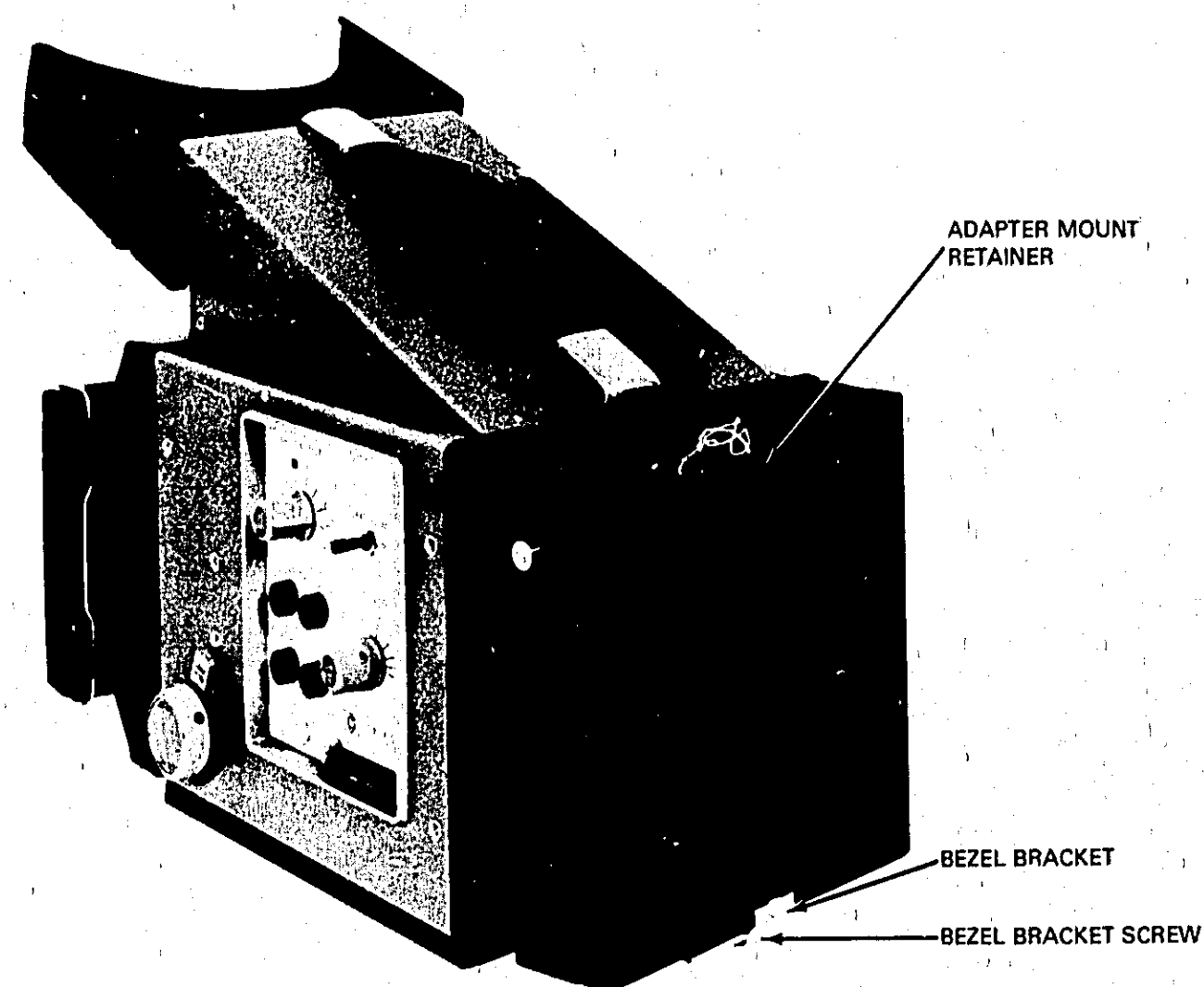
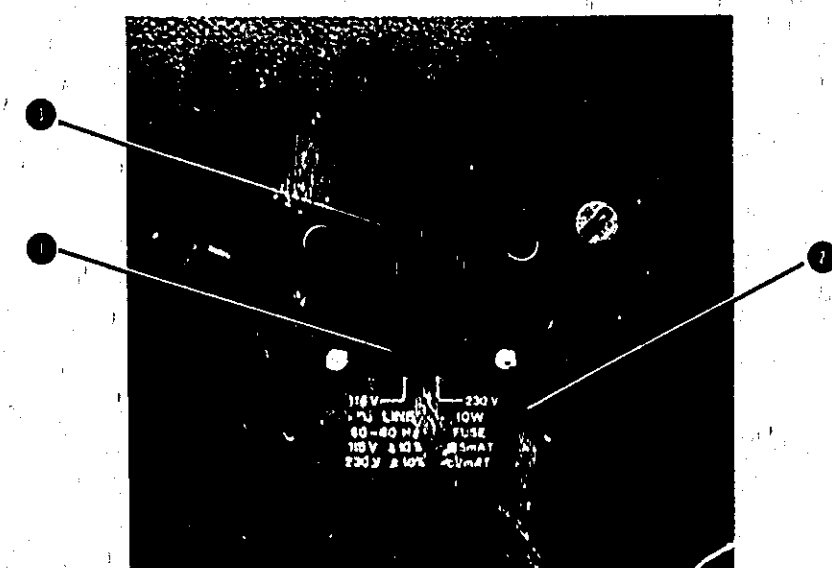
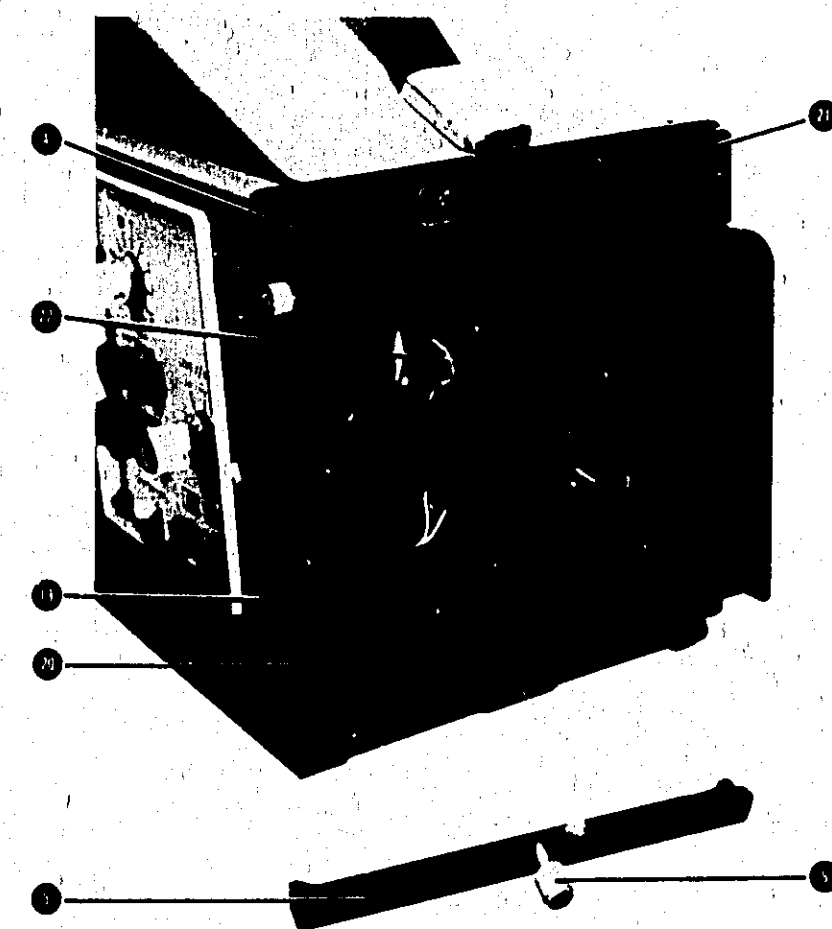


Figure 2-5. Option 006 Camera Front View

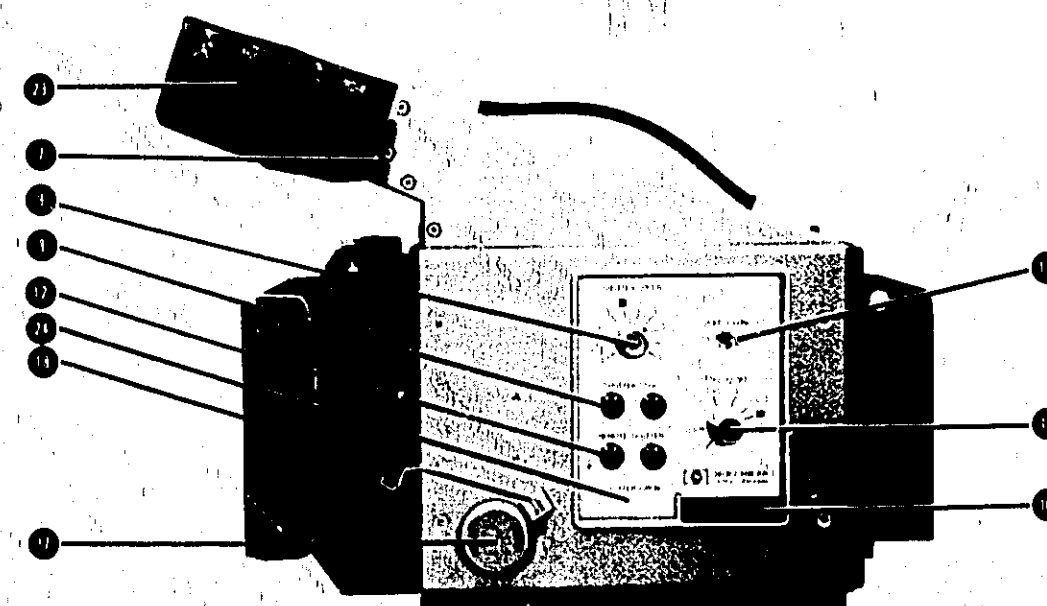
OPERATION



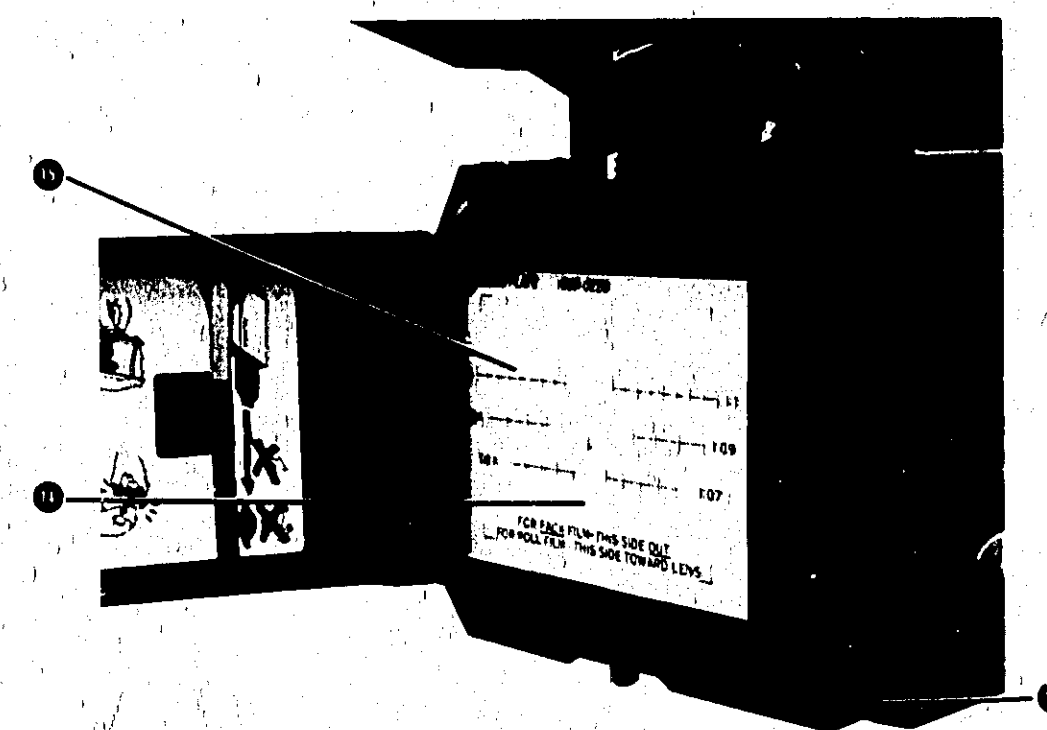
Camera Power Panel



Camera Front View



Camera Control Panel



Camera Back

- 1 Power Selector Switch
- 2 Side Panel Label
- 3 Power Plug
- 4 Standard Front Mount Adapter
- 5 Locking Plate
- 6 Thumb Screw
- 7 Viewer Lever
- 8 Shutter Sync Jacks
- 9 Shutter Speed Switch
- 10 Shutter Bar
- 11 Lens f/No. Control
- 12 Remote Shutter Jacks
- 13 Toggle Switch
- 14 Focus Plate
- 15 Focus Plate Scales
- 16 Focus Plate Storage Compartment
- 17 Focus Control
- 18 Focus Lock Knob
- 19 Front of Right-hand Cover
- 20 Left Side of Camera Front
- 21 Right Side of Camera Front
- 22 Front of Left-hand Cover
- 23 Viewer Door
- 24 Shutter Open Light

Figure 3-0.
All Exterior Camera Views
3-0

SECTION III

OPERATION

3-1. INTRODUCTION.

3-2. This section contains a brief discussion of the operating controls, operation procedures, and basic operating considerations for the Model 197B Oscilloscope Camera.

3-3. CAMERA CONTROLS (See Figure 3-1).

3-4. The following paragraphs provide descriptions of 197B controls and indicators.

3-5. **VIEWER LEVER.** A viewer lever ① on each side of the camera operates the viewer door ② to permit direct viewing of the CRT screen. The door should be closed when taking a picture, but in most cases enough light is blocked by the face to allow photographing while viewing.

3-6. **SHUTTER SYNC JACKS.** These jacks ③ are connected together through a pair of switch contacts

that close when the shutter is actuated, thus enabling synchronization of remote equipment with the shutter action.

3-7. **SHUTTER SPEED SWITCH.** This switch ④ sets the length of time that the shutter remains open. The switch panel indicates the eight time intervals: 1/30, 1/15, 1/8, 1/4, 1/2, 1, 2, and 4 seconds. The two additional switch positions are B (bulb) and T (time). In B position, the shutter opens when the SHUTTER bar ⑩ is pressed, and closes when the bar is released. In T position, pressing the SHUTTER bar opens the shutter, and pressing it again closes the shutter.

3-8. **LENS I/NO. CONTROL.** This control ⑤ adjusts the lens opening (iris) and therefore, the intensity of light transmitted to the film. It is continuously variable from f/1.9 to f/16 (largest to smallest aperture, respectively). The larger the aperture, the shorter the required exposure time for a given film density.

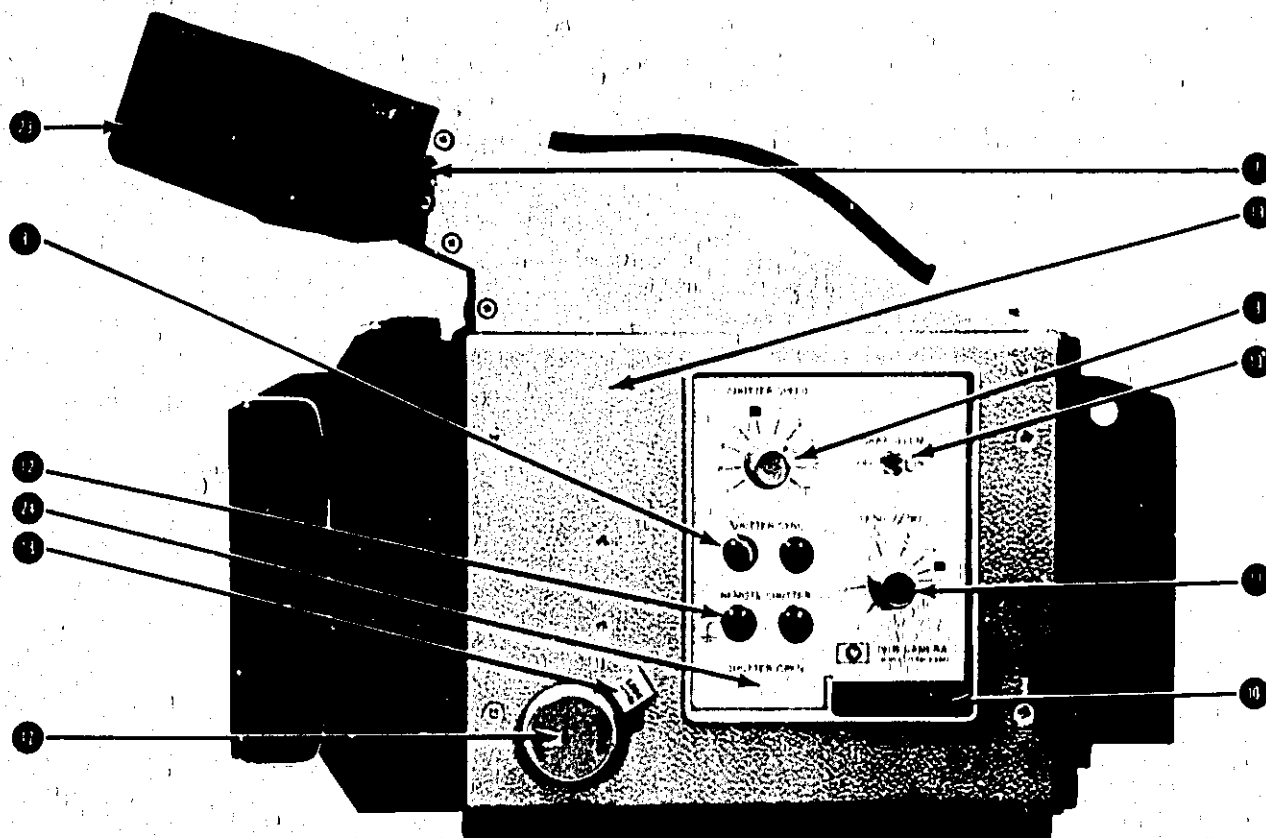


Figure 3-1. Camera Control Panel

3-9. REMOTE SHUTTER JACKS. These jacks ● are connected in parallel with the shutter control switch. This feature may be used with all shutter speeds and requires a TTL low or a shorting (or grounding) action from a remote source to actuate the shutter.

NOTE

If your remote shutter switch has an intermittent connection which allows the shutter to close when the shutter bar ● is pressed and shutter speed ● is in B mode, then use a bounceless remote shutter switch or connect a 1.0 μ F capacitor in parallel with the remote shutter switch contacts.

3-10. OBJECT-TO-IMAGE RATIO ADJUSTMENT. The object-to-image ratio for the 197B can be adjusted from 1:1 to 1:0.7. The ratio is varied by adjusting the brightheaded screw MP55.

3-11. SHUTTER OPEN LIGHT. This light ● is on whenever the shutter is open.

3-12. GRATICULE ILLUMINATION. This toggle switch ● activates the 197B ultraviolet light source.

3-13. PHOTOGRAPHIC FILMS.

3-14. Two versatile film backs enable you to select the photographic film that fits your application. Polaroid ● film is very convenient, providing dry prints in seconds. You have instant feedback on the quality of the photographic record. All of the Polaroid film types listed in table 3-1 have sufficient contrast, gray scale discrimination, resolution, and exposure range to accurately record CRT display images.

3-15. The 197B standard back uses Polaroid pack film. Each pack contains eight exposures with 7.3 x 9.5 cm image sizes. Polaroid 4 x 5 film packets require both the optional Grafluk® back and a Polaroid Model 545 Film Holder. Each packet contains 20 exposures with a 9 x 11.5 cm image size.

3-16. The Grafluk back provides a standard interface for a wide variety of commercially available film holders. Details about holders for 102 x 127 mm (4 x 5 inch) sheet film, 120 roll film, 70 and 90 mm film, and motorized film transports are available from your local professional photographic supplier.

3-17. When selecting film for cathode-ray tube photography, you should match the film's spectral sensitivity to the CRT phosphor. CRT phosphors typically produce light energy over a relatively narrow spectral range. Films with equivalent ASA speed values will perform differently if their spectral sensitivity differs over the spectral output range of the phosphor. Information about most commonly used phosphors is in Hewlett-Packard Application Note 115.

3-18. The Polaroid Corporation maintains a technical information and assistance center for users of Polaroid film and associated products, check film package information for the current phone number or address.

WARNING

The Polaroid process uses a caustic reagent which is sealed in containers within the film pack. If the reagent should accidentally come in contact with the skin, wipe it off immediately. Wash the exposed area with water to avoid an alkali burn. It is particularly important to keep the reagent away from eyes and mouth. Keep the discarded materials out of reach of children and animals, and out of contact with clothing, furniture, and equipment because the discarded materials still contain some reagent.

3-19. CRT PHOSPHOR.

3-20. Although excellent photographs can be obtained with most commonly-used phosphors, the photographic efficiency of a given phosphor can be important when fast single-shot, or low-repetition rate signals are to be recorded. Type P11 phosphor has the most suitable light output (i.e., highest photographic efficiency) for photographic purposes and should be used when maximum writing speed is desired. Other phosphors, in descending order of efficiency are: P31, P2, P7, and P1.

3-21. In general, a filter over the CRT face degrades the picture quality obtained, increases the required exposure, and on external graticule oscilloscopes increases parallax distortion. It is recommended that any filter be removed before taking photographs. An exception is the use of a blue filter to eliminate cathode glow on some unaluminized CRT's. (A blue filter can also be used to eliminate yellow after-glow of long persistence CRT's.)

3-22. OPERATING PROCEDURES.

3-23. GENERAL CONSIDERATIONS. The procedure required to photograph an oscilloscope display is subject to a number of variables that include: trace intensity, phosphor type, shutter speed accuracy, filters used, sweep duty cycle and speed, and limitations imposed by depth-of-field. To simplify operation of the 197B, the shutter speed and aperture setting labels have a blackened position which is optimal in normal situations. One or two trial exposures may be necessary when first operating the camera, or when the operating conditions are changed. The procedures given in the following paragraphs assume the use of an internal graticule oscilloscope with the 197B. Special considerations required for external graticule oscilloscopes are given in paragraph 3-35.

3-24. CRT Filters. Any filter over the CRT face should be removed before taking photographs, except for special purposes as discussed in paragraph 3-21.

3-25. CRT Controls. Trace intensity should be set for optimum trace detail. In some instances, compromises may be necessary to intensify fast-rise or fall portions of a waveform, or to match trace and graticule intensities. Focus and astigmatism should be adjusted for a sharp trace over the full display area; this should be done with a test signal prior to recording single-shot transients.

3-26. Shutter Speed Limitations. The shutter must remain open long enough to record at least one complete sweep, and preferably five to ten sweeps if no drift or jitter is present. Due to the time required for the shutter control circuit to recharge, succeeding shutter

actuators should not be attempted at less than 10-second intervals.

3-27. FOCUS. Focusing of the 197B is completely adjustable, and is performed as follows:

- a. Mount camera on oscilloscope and apply power to camera.
- b. Open camera back and insert focus plate ⑩.

NOTE

If there is a film pack in camera, it must be removed (this exposes top film in pack and it must be removed after pack is reinstalled in camera).

Table 3-1. Polaroid Film Selection

Film Type	Application Characteristics	ASA Equivalent Speed	Resolution Line Pairs/mm	Development Time (Secs at 75°F)
Pack Films	3-1/4 x 4-1/4 in. - Actual image size 7.3 x 9.5 cm.	197B Camera with standard Polaroid Pack Back		
107	Most popular CRT film - high speed, medium contrast.	3000	16-22	15
084	Professional version of Type 107 selected for more uniform specifications.	3000	16-22	15
107C	Similar to Type 107 except prints do not require coating.	3000	16-20	30
667	Professional version of Type 107C selected for more uniform specifications.	3000	16-20	30
665	Provides both a positive print for quick-look use and a negative for enlargements.	75	14-20 (print) 160-180 (neg)	30
4 x 5 Film Packet	Actual image size 9 x 11.5 cm.	197B Camera with Graflok back and Polaroid 545 Film Holder		
57	General Purpose CRT film - high speed, medium contrast.	3000	16-22	15
52	Fine grain film for applications requiring high resolution.	400	35-40	15-20
55	Provides both a positive print and a permanent negative.	50	22-25 (print) 150-160 (neg)	20-25
51	High contrast, blue sensitive for use with P11 phosphor.	320 (daylight)	28-32	20

- c. Set camera controls as follows:

SHUTTER SPEED T
LENS f/NO. 1.9

- d. Press SHUTTER bar ⑩ to open shutter.

e. Verify that focus plate ⑭ is flat against film frame (as shown in figure 3-2) with proper side toward lens. Adjust FOCUS control ⑪ until vertical graticule line is no longer split when viewed simultaneously through top and bottom of split-image spot in center of focus plate (See Figure 3-3).

f. When focus adjustment is complete, tighten FOCUS LOCK knob ⑫ and recheck focus. Remove focus plate, close shutter, and reset all camera controls to normal.

3-28. RECURRENT SWEEP EXPOSURES. The following procedure assumes a stable display of normal intensity. If the display is unstable, a faster shutter speed (1/30 sec is fastest) should be used with a larger aperture (smaller number). It should be noted that approximately the same exposure is obtained by various combinations of

shutter speed and aperture (i. e., 1/2 sec at f/5.6 and 2 sec at f/11 correspond to 1 sec at f/8). If the display intensity is weak, and cannot be improved by adjusting the oscilloscope intensity control, a larger aperture should be used with a slower shutter speed.

3-29. To photograph a recurrent sweep display, proceed as follows:

- a. Set camera controls as follows:

SHUTTER SPEED 1
LENS f/NO. 8

- b. Close viewer door ⑦.

- c. Press SHUTTER bar ⑩ to actuate shutter.

- d. Develop print according to instruction sheet supplied with film.

NOTE

If print is overexposed (too light), use smaller aperture (larger f-number); if underexposed, use larger aperture.

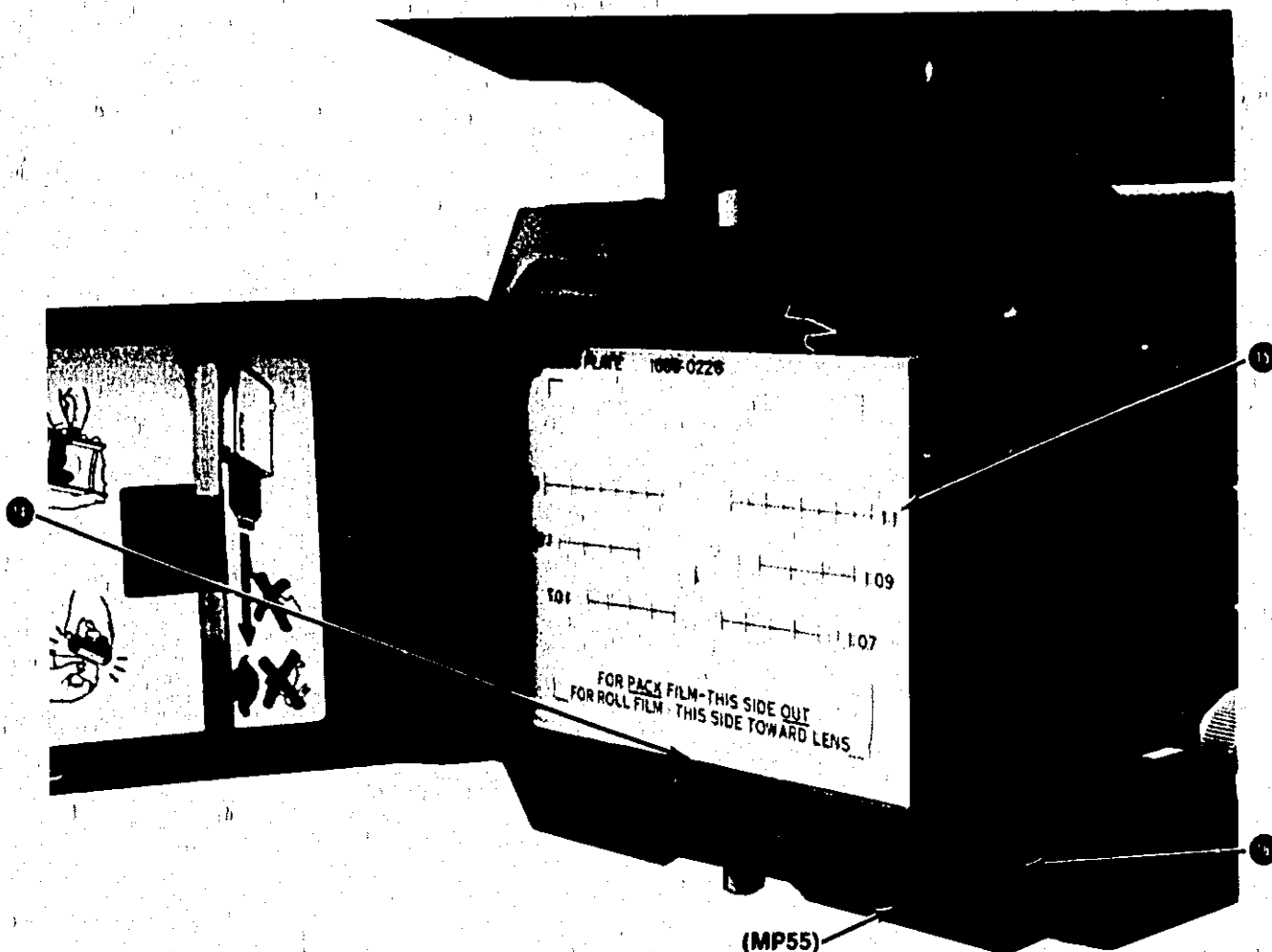


Figure 3-2. Camera Back

3-30. SINGLE SWEEP EXPOSURE. Single-trace photography of fast transients is possible by using the high sensitivity film now available. Single events that are too fast or too faint for the eye to detect can be captured on this film. In single-trace photography, the oscilloscope should be set up initially using a pulse generator operating at a low repetition rate (30 Hz or less) as a test signal. The low repetition rate avoids the increase in trace brightness caused by phosphor

persistence when traces overlap, and permits optimum CRT focus adjustment. During this initial adjustment, the sweep speed should be set for the same speed to be used in the final photograph. To take a photograph of the desired transient, the camera shutter is held open manually on B or T while the oscilloscope sweep is triggered once by the signal being photographed. One precaution regarding external graticules concerns parallax (refer to paragraph 3-37) between trace and

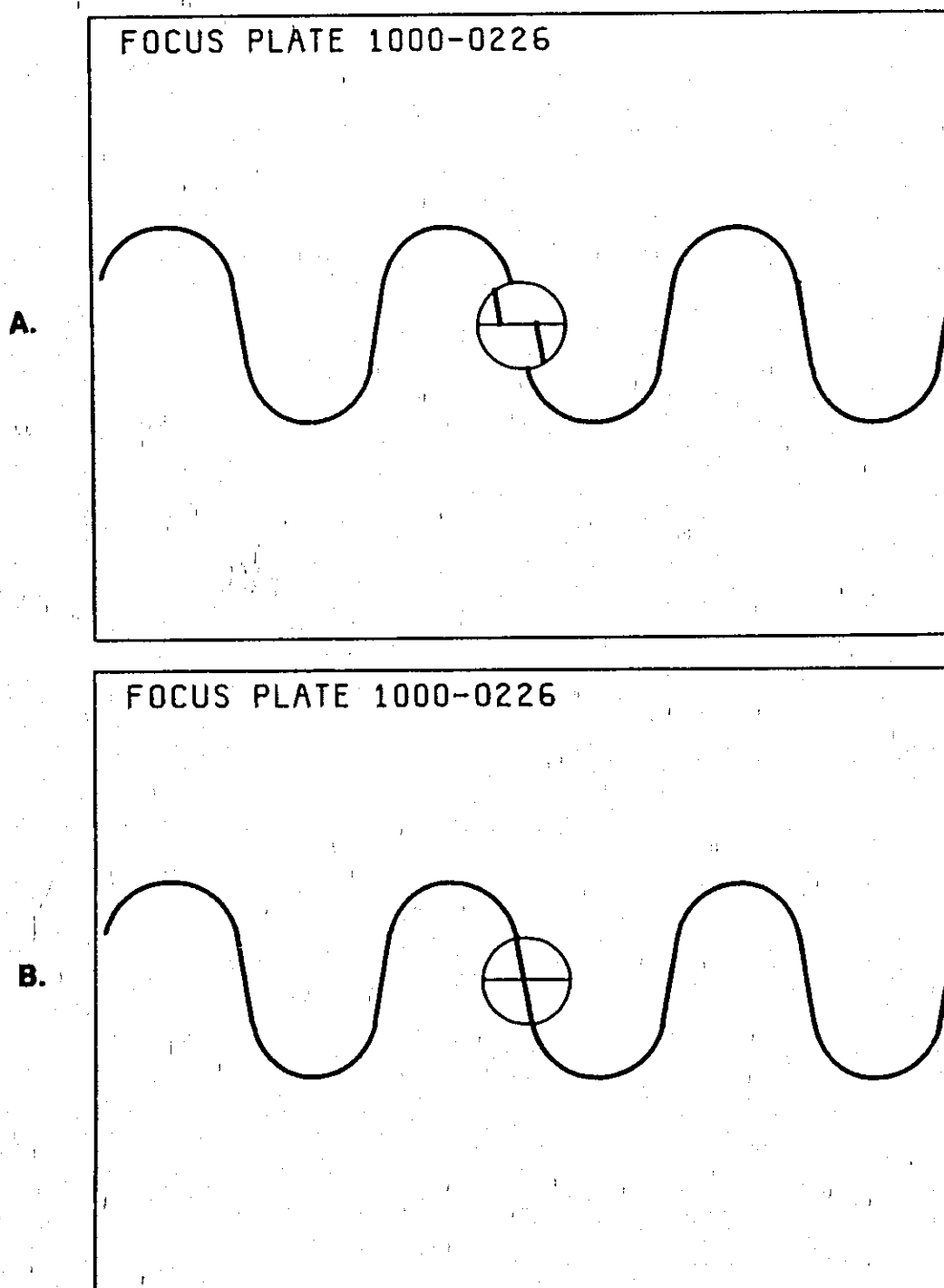


Figure 3-3. A. Waveform Out of Focus
B. Waveform In Focus

graticule; allowance for parallax should be made when adjusting the trace amplitude and position. If an internal graticule CRT is being used, parallax is not present.

3-31. To photograph a single-sweep display, proceed as follows:

- a. Set SHUTTER SPEED ④ to T or B.
- b. Set LENS f/NO. ⑤ wide open (f/1.9) if display is dim, or f/8 if normal. These are trial settings; experience with given conditions will indicate preferred settings. If a large aperture is used, focusing becomes critical.
- c. Assure good visual presentation of signal when it is displayed. Set CRT intensity high, but not so high as to cause a halo, defocusing, or loss of detail. Check CRT focus on single-shot or low repetition rate signals.
- d. Close viewer door ⑥.
- e. Open shutter.
- f. Trigger single sweep.
- g. Close shutter.
- h. Develop print according to instruction sheet supplied with film.

3-32. OBJECT-TO-IMAGE RATIO ADJUSTMENT. Object-to-image (reduction) ratio of the 197B is adjustable from 1:1 to 1:0.7. The focus plate is imprinted with three scales ⑦ that are used to set the ratio to 1:1, 1:0.9, or 1:0.7. Adjust ratio as follows:

- a. Mount camera on oscilloscope, and apply power to camera.
- b. Remove focus plate from storage compartment ⑧ on bottom of camera.
- c. Open camera back and insert focus plate (see figure 3-2).

NOTE

If there is a film pack in camera, it must be removed (this exposes top film in pack and it must be removed after pack is reinstalled in camera).

- d. Set camera controls as follows:

SHUTTER SPEED T
LENS f/NO. 1.9

- e. Press SHUTTER bar ⑨ to open shutter.

f. Ensure focus plate ⑩ is flat against film frame and adjust object-to-image ratio screw (MP55) until graticule lines are aligned with calibration marks (for desired ratio) on focus plate.

NOTE

When adjusting camera for 1:1 ratio, it may be necessary to turn focus plate upside down.

g. When reduction ratio adjustment is completed, check focus and adjust if necessary.

h. Remove focus plate and replace in storage compartment ⑩. Close shutter and reset all camera controls to normal.

3-33. REMOTE SHUTTER AND SHUTTER SYNCHRONIZATION. The shutter of the 197B may be actuated from a remote source. This function occurs with TTL low or when the remote source closes a circuit between the REMOTE SHUTTER jacks ⑪. When this feature is used, there is a mechanical delay between the time that the signal is received and the time that the shutter is actually open. The approximate delay time is as follows:

5ms	shutter starts to open
8.5ms	shutter is half open
12ms	shutter fully open

3-34. The SHUTTER SYNC jacks ⑫ provide a closed circuit when the shutter is actuated. This feature permits synchronization of other equipment with the shutter action. For example, the single sweep action of the oscilloscope could be triggered through this switch action. However, the mechanical delay in actual shutter opening as previously described above must be considered.

3-35. EXTERNAL GRATICULE CONSIDERATIONS.

3-36. Several problem areas must be considered when attempting to photograph displays on an oscilloscope with an external graticule.

3-37. PARALLAX. In the internal graticule CRT, the graticule lines are in the same plane as the phosphor. This arrangement eliminates any parallax between the graticule and the display. With external graticule CRT's, the graticule and phosphor are separated, and parallax enters into the measurement. Two parallax effects, as illustrated in figure 3-4, are present.

a. Parallax caused by the difference between lens viewing angle (B) in figure 3-4 and straight-on viewing angle (A).

b. Parallax caused by the difference between lens viewing angle (B) and eye viewing angle (C).

3-38. Parallax problems can be minimized by making certain that the CRT face is in direct contact with the graticule. If scale measurements are to be made from the photographs, determine the error due to parallax and make the necessary corrections when viewing the display before exposure. For maximum accuracy, make scale measurements near the center of the photograph.

3-39. **DEPTH-OF-FIELD.** An important effect to consider when using an external graticule is depth-of-field, the range of object distances within which the

image (formed on the film by the lens) will be in focus. Depth-of-field has an inverse relationship with aperture size; that is, the larger the aperture, the shorter the depth of field. To have both an external graticule and the display in focus at the same time, the aperture should be about $f/5.6$ or smaller (larger f-number). For this reason, separate exposure of the graticule and display is recommended whenever an aperture larger than $f/5.6$ is required. Since the corners of the film are farther from the lens than the center of the film, a short depth-of-field could leave a portion of the film out of focus.

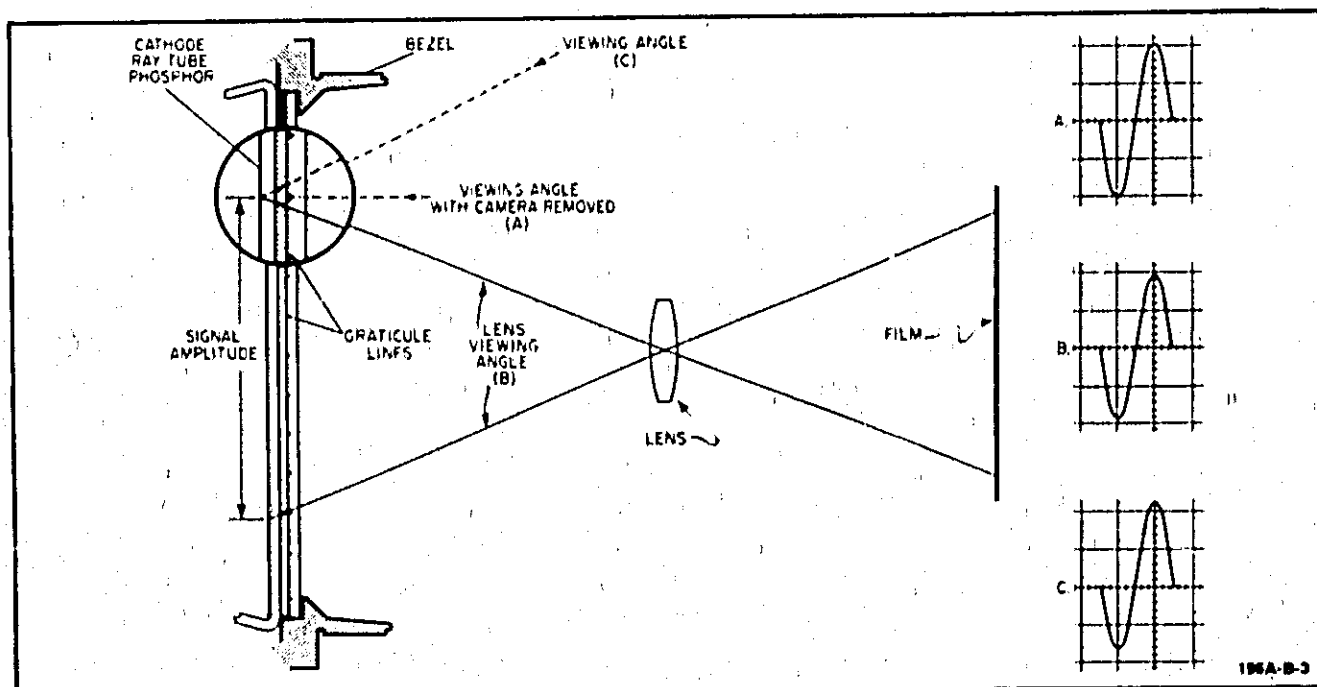


Figure 3-4. Parallax Effects.

PERFORMANCE CHECK

ADJUSTMENTS

SECTION IV

PERFORMANCE CHECK

4-1. INTRODUCTION.

4-2. This section contains procedures for checking the Model 197B performance.

4-3. PERFORMANCE CHECK.

4-4. This check may be used as an incoming quality control check, as a periodic operational check, or after repairs have been made.

4-5. SHUTTER OPERATION. The following procedure verifies shutter operation.

- a. Connect power to the 197B.
- b. Set SHUTTER SPEED selector switch ① to T.
- c. Press SHUTTER control bar ⑩ and visually verify that shutter opens. (It may be necessary to open camera back and observe shutter action through camera.)

- d. Press SHUTTER control bar ⑩ and verify that shutter closes.

4-6. LIGHT LEAKAGE. Check for light leakage in the 197B as follows:

- a. Mount camera on oscilloscope and apply power [set power selector switch ①].
- b. Ensure that there is no display on oscilloscope.
- c. Set SHUTTER SPEED selector switch ① to 1 second.
- d. Set LENS f./NO. control ② to 1.9.
- e. Press SHUTTER control bar ⑩ and develop resulting photograph. Resulting print should be completely black.

NOTE

If light leakage occurs, refer to Section VIII for possible causes.

SECTION V ADJUSTMENTS

5-1. INTRODUCTION.

5-2. This section describes adjustments required to return the instrument to peak operating capabilities when repairs have been made.

5-3. SAFETY REQUIREMENTS.

5-4. Although this instrument has been designed in accordance with international safety standards, general safety precautions must be observed during all phases of operation, service, and repair. Failure to comply with the precautions listed in the Safety Summary at the front of this manual or with specific warnings given throughout this manual could result in serious injury or death. Service and adjustments should be performed only by qualified service personnel.

5-5. ADJUSTMENTS.

5-6. There are no electrical adjustments for Model 197B. Procedures for two of the three mechanical adjustments, focus, and reduction ratio, are in Section III. The other mechanical adjustment is calibration of the LENS f/NO. control (1) and is performed as follows:

- a. Rotate LENS f/NO. control (2) fully counter-clockwise.
- b. Loosen two knob setscrews and position knob so that pointer is aligned with calibration mark below 1.9 position (the mark without a number by it).
- c. Tighten knob setscrews.

PARTS LIST

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for ordering parts. Abbreviations used in the parts list are in table 6-1. Table 6-2 lists the parts in alphanumeric order by reference designation and includes the manufacturer and manufacturer's part number. Table 6-3 lists manufacturer's codes.

6-3. ABBREVIATIONS.

6-4. Table 6-1 lists abbreviations used in the parts lists, the schematics and throughout the manual. In some cases, two forms of the abbreviation are used, one all in capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts list are always all capitals. However, in the schematics and other parts of the manual, other abbreviation forms are used with both lower case and upper case letters.

6-5. REPLACEABLE PARTS LIST.

6-6. Table 6-2 is the list of replaceable parts and is organized as follows:

- a. List of electrical assemblies.
- b. Chassis-mounted parts in alphanumeric order by reference designation.
- c. Electrical assemblies and their components in alphanumeric order by reference designation.

The information given for each part consists of the following:

- a. The Hewlett-Packard part number and check digit.
- b. The total quantity (Qty) in the instrument.
- c. The description of the part.
- d. A typical manufacturer of the part in a five-digit code.
- e. The manufacturer's number for the part.

The total quantity for each part is given only once at the first appearance of the part number in the list.

6-7. ORDERING INFORMATION.

6-8. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

6-9. To order a part that is not listed in the Replaceable Parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

6-10. SPARE PARTS KIT.

6-11. Stocking spare parts for an instrument is often done to ensure quick return to service after a malfunction occurs. Hewlett-Packard has a spare parts kit available for this purpose. The kit consists of selected replaceable assemblies and components for this instrument. The contents of the kit and the recommended spares list are based on failure reports and repair data, and parts support for one year. A recommended spares list for this instrument may be obtained on request and the spare parts kit may be ordered through your nearest Hewlett-Packard office.

6-12. DIRECT MAIL ORDER SYSTEM.

6-13. Within the USA, Hewlett-Packard can supply parts through a direct mail order system. Advantages of using the system are as follows:

- a. Direct ordering and shipment from the HP Parts Center in Mountain View, California.
- b. No maximum or minimum on any mail order (there is a minimum order amount for parts ordered through a local HP office when the orders require billing and invoicing).
- c. Prepaid transportation (there is a small handling charge for each order).
- d. No invoices. To provide these advantages, a check or money order must accompany each order.

6-14. Mail order forms and specific ordering information are available through your local HP office. Addresses and phone numbers are located at the back of this manual.

Table 6-1. Reference Designators and Abbreviations

REFERENCE DESIGNATORS

A	= assembly	F	= fuse	MP	= mechanical part	U	= integrated circuit
B	= motor	FL	= filter	P	= plug	V	= vacuum tube, neon bulb, photocell, etc
BT	= battery	IC	= integrated circuit	Q	= transistor	VR	= voltage regulator
C	= capacitor	J	= jack	R	= resistor	W	= cable
CP	= coupler	K	= relay	RT	= thermistor	X	= socket
CR	= diode	L	= inductor	S	= switch	Y	= crystal
DL	= delay line	LS	= loud speaker	T	= transformer	Z	= tuned cavity network
DS	= device signaling (lamp)	M	= meter	TB	= terminal board		
E	= misc electronic part	MK	= microphone	TP	= test point		

ABBREVIATIONS

A	= amperes	H	= henries	N/O	= normally open	RMO	= rack mount only
AFC	= automatic frequency control	HDW	= hardware	NOM	= nominal	RMS	= root-mean square
AMPL	= amplifier	HEX	= hexagonal	NPO	= negative positive zero (zero temperature coefficient)	RWV	= reverse working voltage
BFO	= beat frequency oscillator	HG	= mercury	NPN	= negative-positive-negative	S-B	= slow-blow
BE CU	= beryllium copper	HR	= hours	NRFR	= not recommended for field replacement	SCR	= screw
BH	= binder head	HZ	= hertz	NSR	= not separately replaceable	SE	= selenium
BP	= bandpass					SECT	= sectional
BR	= brass	IF	= intermediate freq			SEMICON	= semiconductor
BWO	= backward wave oscillator	IMPG	= impregnated			SI	= silicon
		INCD	= incandescent			SIL	= silver
CCW	= counter-clockwise	INCL	= included	OBD	= order by description	SL	= slide
CER	= ceramic	INS	= insulation	OH	= oyst head	SPG	= spring
CMO	= cabinet mount only	INT	= internal	OX	= oxide	SPL	= special
COEF	= coefficient					SST	= stainless steel
COM	= common	K	= kilo-1000			SR	= split ring
COMP	= composition			P	= peak	STL	= steel
COMPL	= complete	LM	= left hand	PC	= printed circuit		
CONN	= connector	LIN	= linear taper	PF	= picofarads-10 ⁻¹² farads	TA	= tantalum
CP	= cadmium plate	LK WASH	= lock washer	PH BRZ	= phosphor bronze	TD	= time delay
CRT	= cathode-ray tube	LOG	= logarithmic taper	PHL	= phillips	TGL	= toggle
CW	= clockwise	LPF	= low pass filter	PIV	= peak inverse voltage	THD	= thread
				PNP	= positive-negative-positive	TI	= titanium
DEPC	= deposited carbon	M	= milli-10 ⁻³			TOL	= tolerance
DR	= drive	MEG	= meg-10 ⁶	P/O	= part of	TRIM	= trimmer
		MET FLM	= metal film	POLY	= polystyrene	TWT	= traveling wave tube
ELECT	= electrolytic	MET OX	= metallic oxide	PORC	= porcelain		
ENCAP	= encapsulated	MFR	= manufacturer	POS	= position(s)	U	= micro-10 ⁻⁶
EXT	= external	MHZ	= mega hertz	POT	= potentiometer	VAR	= variable
		MINAT	= miniature	PP	= peak-to-peak	VDCW	= dc working volts
F	= farads	MOM	= momentary	PT	= point		
FH	= flat head	MOS	= metal oxide substrate	PWV	= peak working voltage	W/	= with
FIL H	= filister head	MTG	= mounting			W	= watts
FXD	= fixed	MY	= "mylar"	RECT	= rectifier	WIV	= working inverse voltage
				RF	= radio frequency	WW	= wirewound
G	= giga-10 ⁹	N	= nano-10 ⁻⁹	RH	= right hand	W/O	= without
GE	= germanium	N/C	= normally closed				
GL	= glass	NE	= neon				
GRD	= grounded	NI PL	= nickel plate				

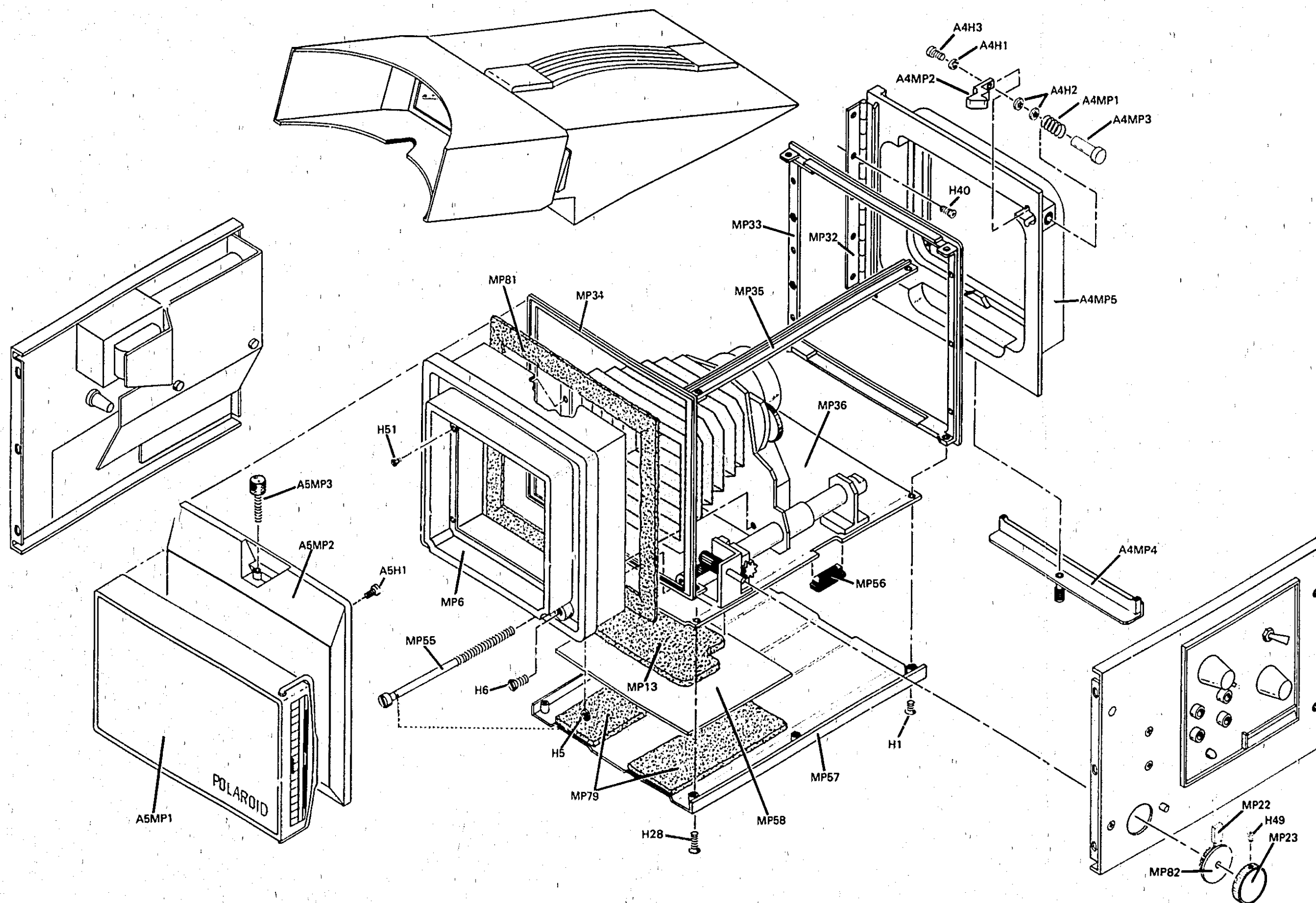


Figure 6-1
Model 197B Exploded View
6-3

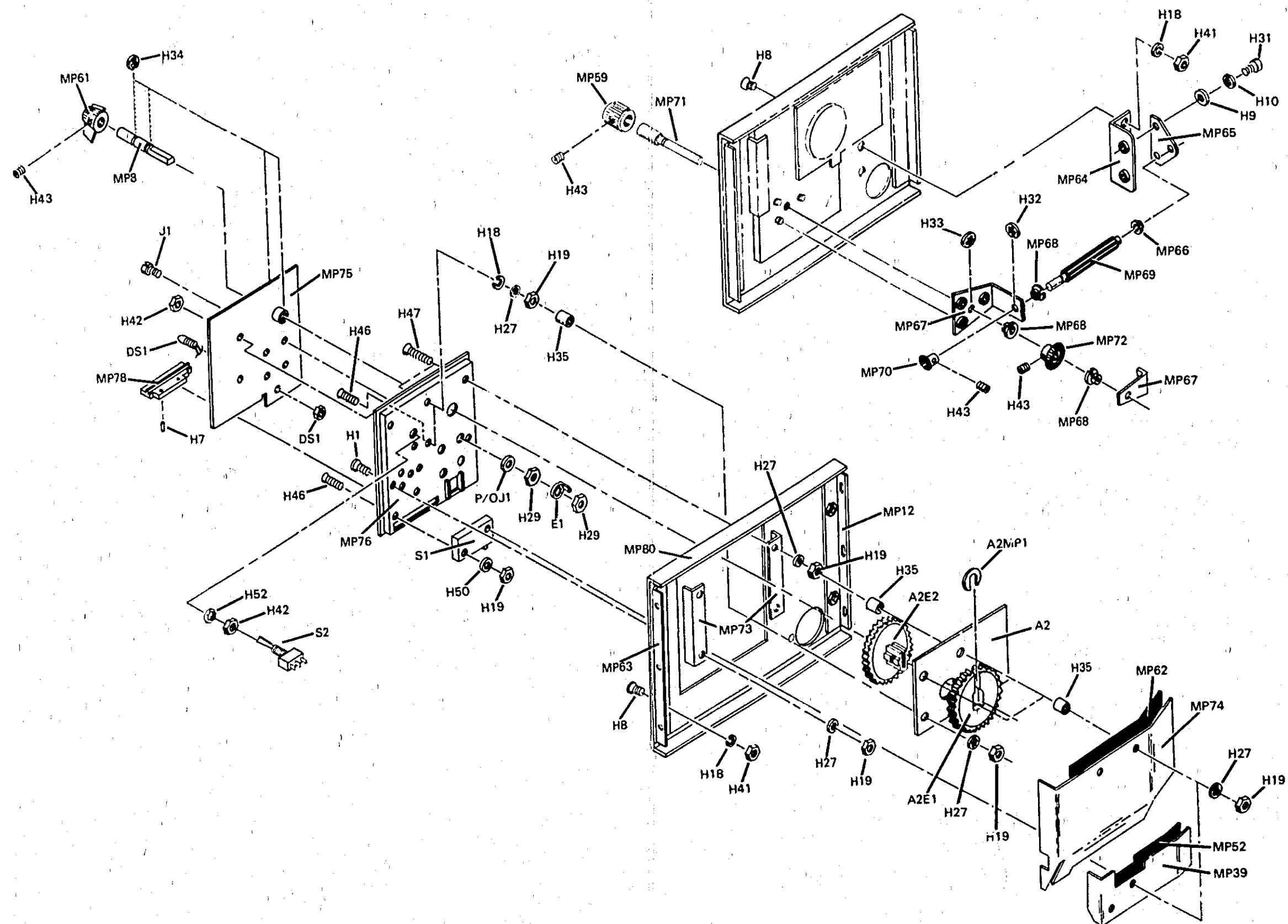


Figure 6-2. Camera Control Panel Exploded View

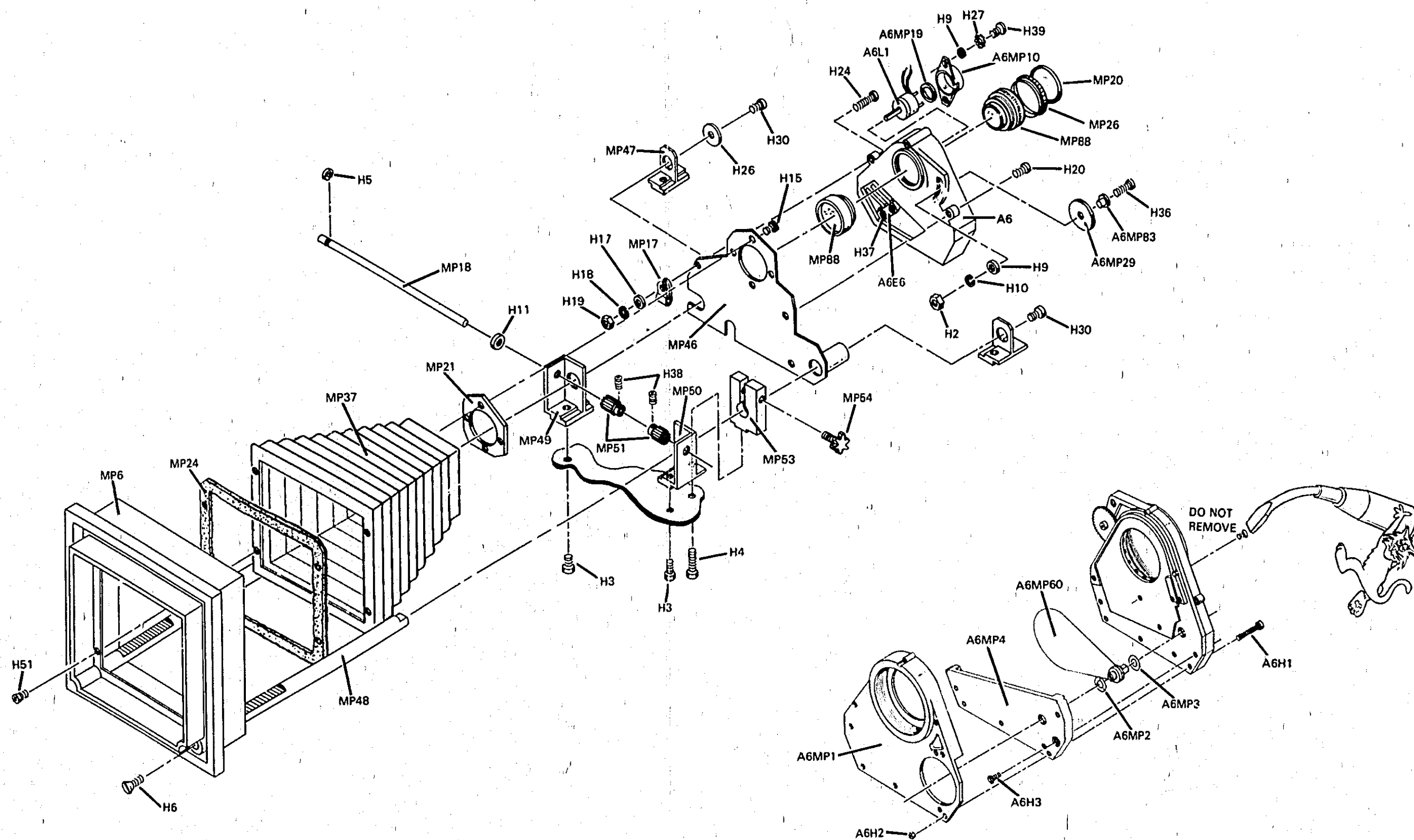
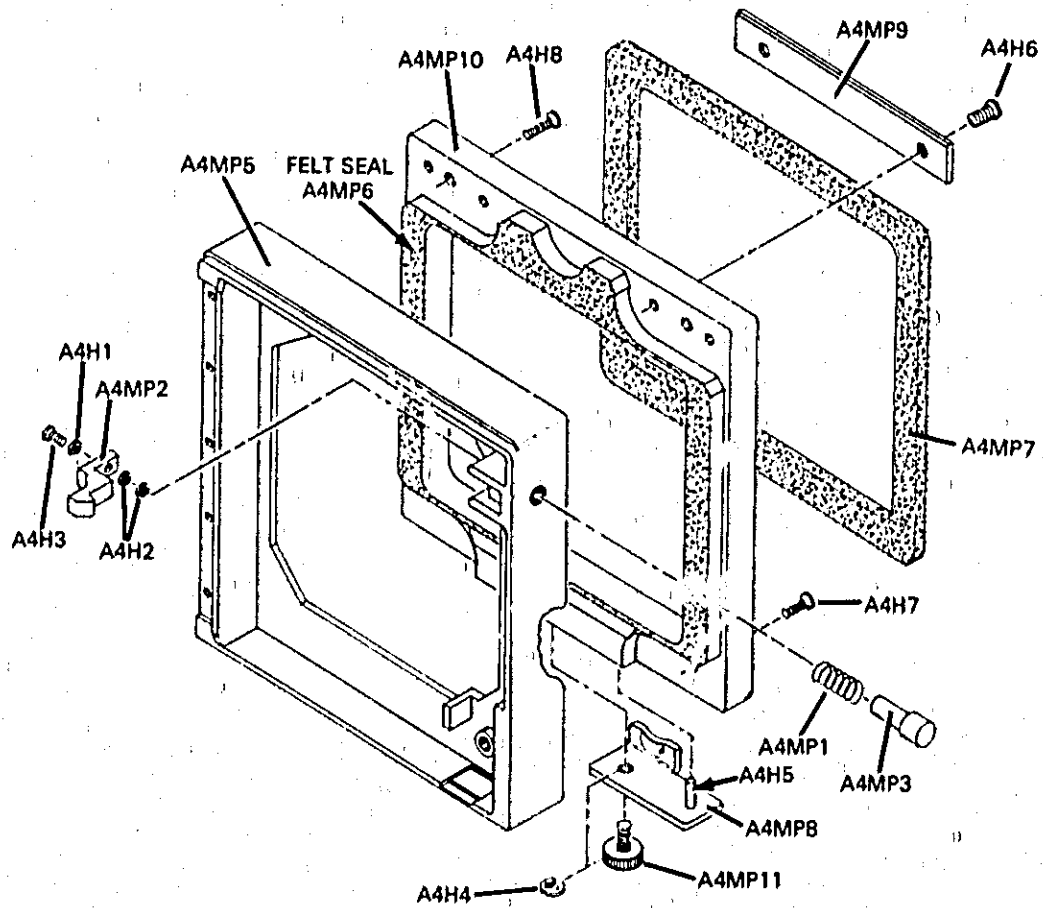


Figure 6-4. Camera Internal Exploded View

A.



B.

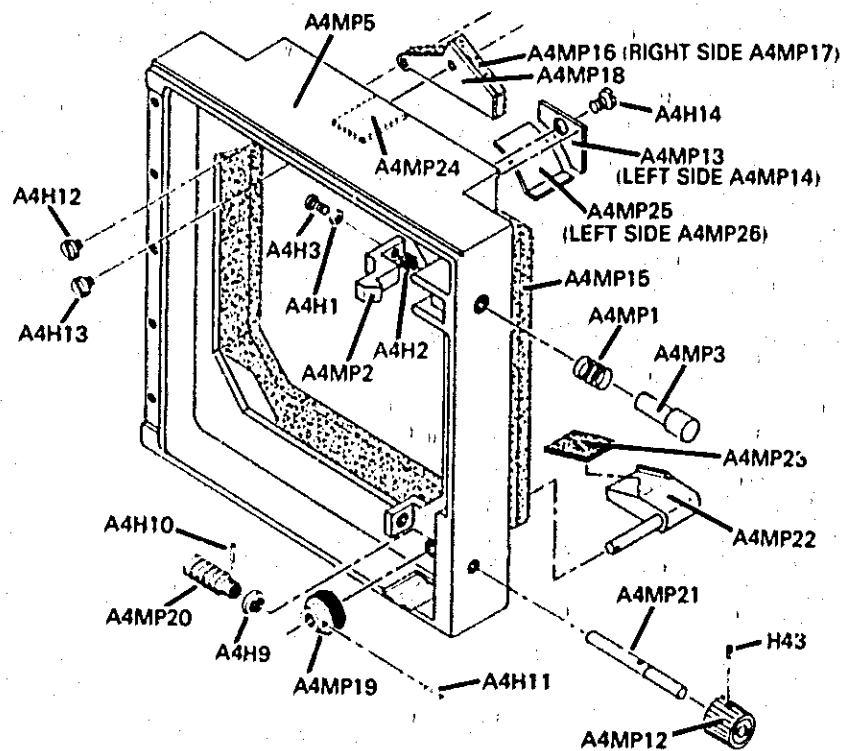


Figure 6-5. A. Option 006 Bezel Exploded View
B. Option 002 Bezel Exploded View

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	00197 66508	3	1	BOARD ASSEMBLY POWER	28480	00197 66508
A2	00197 66504	0	1	SWITCH BOARD ASSEMBLY	28480	00197 66504
A3	00197 66509	4	1	BOARD ASSEMBLY UV	28480	00197 66509
A4	10376A	2	1	CAMERA ADAPTOR KIT	28480	10376A
A4 (OPT 002)	10378A	4	1	CAMERA ADAPTOR 1078	28480	10378A
A4 (OPT 006)	10375A	1	1	CAMERA ADAPTOR	28480	10375A
A5	10353B	7	1	CAMERA BACK	28480	10353B
A5 (OPT 003)	10352B	5	1	CAMERA BACK	28480	10352B
A6	00197 69501	2	1	SHUTTER ASSEMBLY	28480	00197 69501
D51	1450 0392	0	1	LIGHT INDICATOR WHITE 6 3V	28480	1450 0392
E1	0360 0040	2	5	TERMINAL SLDR LUG LK MTG FOR #1/4 SCR	28480	0360 0040
E2	0360 0001	5	1	TERMINAL SLDR LUG LK MTG FOR #6 SCR	28480	0360 0001
E3	0380 1158	7	1	SPACER RND 25 IN LG 5 IN ID 625 IN OD	00000	ORDER BY DESCRIPTION
E4	2110 0564	8	1	FUSEHOLDER BODY 12A MAX FOR UL	H9027	031 1657
E5	2110 0565	0	1	FUSEHOLDER CAP 12A MAX FOR UL	28480	2110 0565
F1	2110 0064	3	1	FUSE 125A 250V TD 1 25X 25 UL	28480	2110 0064
F1	2110 0311	3	1	FUSE 062A 250V TD 1 25X 25 UL	75915	313 062
H1	2200 0159	8	13	SCREW MACH 4 40 25 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
H2	2260 0002	6	0	NUT HEX DBL CHAM 4 40 THD 062 IN THK	00000	ORDER BY DESCRIPTION
H3	0624 0073	1	7	SCREW TPG 6 32 312 IN LG PAN HD SLT STL	00000	ORDER BY DESCRIPTION
H4	0624 0074	2	1	SCREW TPG 6 32 375 IN LG PAN HD SLT STL	00000	ORDER BY DESCRIPTION
H5	0510 0956	8	1	RING RETAINING 0 188 SHAFT	79135	132 18 MD
H6	2510 0118	6	2	SCREW MACH 8 32 5 IN LG 100 DEG	00000	ORDER BY DESCRIPTION
H7	1480 0069	0	2	PIN ROLL 062 IN DIA 25 IN LG STL	28480	1480 0069
H8	2360 0184	0	10	SCREW MACH 6 32 312 IN LG 100 DEG	00000	ORDER BY DESCRIPTION
H9	3050 0106	6	7	WASHER FL MTLN NO 4 125 IN ID	28480	3050 0106
H10	2190 0030	1	7	WASHER LK HLCL NO 4 115 IN ID	28480	2190 0030
H11	3050 0002	2	1	WASHER FL MTLN NO 10 203 IN ID	28480	3050 0002
H12	2200 0165	5	4	SCREW MACH 4 40 25 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
H13	0510 0015	0	1	RETAINER RING E R EXT 125 IN DIA STL	28480	0510 0015
H14	0620 0155	0	2	SCREW MACH 2 56 125 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
H15	0620 0160	7	4	SCREW MACH 2 56 25 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
H16	2200 0092	8	2	SCREW MACH 4 40 125 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
H17	3050 0066	8	1	WASHER FL MTLN NO 6 147 IN ID	28480	3050 0066
H18	2190 0018	5	13	WASHER LK HLCL NO 6 141 IN ID	28480	2190 0018
H19	2260 0001	5	14	NUT HEX DBL CHAM 4 40 THD 094 IN THK	28480	2260 0001
H20	2200 0143	0	1	SCREW MACH 4 40 375 IN LG PAN HD FOZI	00000	ORDER BY DESCRIPTION
H21	2200 0164	5	6	SCREW MACH 4 40 188 IN LG UNCT 82 DEG	00000	ORDER BY DESCRIPTION
H22	2200 0155	4	2	SCREW MACH 4 40 1 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
H23	3050 0019	1	1	WASHER FL MTLN NO 10 2 IN ID 5 IN OD	28480	3050 0019
H24	2200 0149	6	1	SCREW MACH 4 40 825 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
H25	2360 0113	2	7	SCREW MACH 6 32 25 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
H26	2190 0707	0	1	WASHER FL MTLN NO 8 188 IN ID	28480	2190 0707
H27	2190 0468	0	1	WASHER LK INTL F NO 4 116 IN ID	28480	2190 0468
H28	2200 0170	3	6	SCREW MACH 4 40 625 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
H29	2950 0006	3	8	NUT HEX DBL CHAM 1/4 32 THD 094 IN THK	00000	ORDER BY DESCRIPTION
H30	2550 0035	0	2	SCREW MACH 8 32 25 IN LG PAN HD SLT	00000	ORDER BY DESCRIPTION
H31	3030 0253	3	2	SCREW SKT HD CAP 4 40 25 IN LG ALY STL	00000	ORDER BY DESCRIPTION
H32	0510 0166	2	1	RETAINER RING E R EXT 156 IN DIA STL	28480	0510 0166
H33	0510 0715	7	1	RETAINER RING BWD E EXT 188 IN DIA STL	28480	0510 0715
H34	0510 0091	2	2	RETAINER RING CRSTN EXT 5 IN DIA STL	28480	0510 0091
H35	0380 0022	2	5	SPACER RND 375 IN LG 128 IN ID	28480	0380 0022
H36	2200 0091	7	1	SCREW MACH 4 40 562 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
H37	2200 0762	9	2	SCREW MACH 4 40 25 IN LG TR HD POZI	00000	ORDER BY DESCRIPTION
H38	3030 0329	4	4	SCREW SET 4 40 125 IN LG SMALL CUP PT	00000	ORDER BY DESCRIPTION
H39	2200 0163	4	4	SCREW MACH 4 40 375 IN LG TR HD SLT	00000	ORDER BY DESCRIPTION
H40	2200 0139	4	10	SCREW MACH 4 40 25 IN LG PAN HD POZI	00000	ORDER BY DESCRIPTION
H41	2420 0003	7	10	NUT HEX DBL CHAM 6 32 THD 094 IN THK	00000	ORDER BY DESCRIPTION
H42	2950 0052	9	1	NUT HEX DBL CHAM 1/4 40 THD 062 IN THK	00000	ORDER BY DESCRIPTION
H43	0570 0183	0	8	SCREW SET 4 40 125 IN LG SMALL CUP PT	28480	0570 0183
H44	2190 0011	8	2	WASHER LK INTL F NO 10 195 IN ID	28480	2190 0011
H45	2740 0001	3	2	NUT HEX DBL CHAM 10 32 THD 109 IN THK	00000	ORDER BY DESCRIPTION
H46	2200 0758	3	3	SCREW MACH 4 40 812 IN LG 100 DEG	00000	ORDER BY DESCRIPTION

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
H47	2200-0175	8	2	SCREW MACH 4 40 1 25-IN LG 82 DEG	00000	ORDER BY DESCRIPTION
H48	2360-0179	0	2	SCREW MACH 6 32 625 IN LG BDG-HD SLT	00000	ORDER BY DESCRIPTION
H49	3030-0022	4	2	SCREW SET 6-32 126 IN LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
H50	3050-0011	3	2	WASHER FL NM NO 5 13 IN ID 26-IN OD	28480	3050-0011
H51	0620-0161	8	4	SCREW MACH 2 56 312 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
H52	2190-0084	5	1	WASHER LX INTL T 1/4 IN 256-IN ID	28480	2190-0084
J1	00197-27601	5	4	BANANA JACK	28480	00197-27601
J2	1251-2357	8	1	CONNECTOR AC PWR HP 9 MALE FLG MTG	28480	1251-2357
MP1	4320-0019	5	1	197A VIEW HOOD	28480	4320-0019
MP2	00197-44101	5	1	COVER TOP END VH	28480	00197-44101
MP3	00197-44102	7	1	COVER BOTTOM END VH	28480	00197-44102
MP4	00197-44901	4	1	DOOR VIEW HOOD	28480	00197-44901
MP5	1460-0279	2	1	SPRING-TRSN 288 IN OD 096 IN OA LG MUW	28480	1460-0279
MP6	5041-1545	3	1	MOUNT LIGHT SHIELD	28480	5041-1545
MP7	1440-0035	6	1	HANDLE-VINYL	28480	1440-0035
MP8	00197-23708	5	1	SHAFT-CAMERA SWITCH	28480	00197-23708
MP9	00197-01207	3	1	BRACKET HOOD FRONT	28480	00197-01207
MP11	00197-01217	5	1	BRACKET UV LAMP	28480	00197-01217
MP12	00197-01209	5	1	BRACKET REAR MOUNTING	28480	00197-01209
MP13	00197-04107	8	1	CUSHION FELT	28480	00197-04107
MP14	9300-0081	4	3	RIBBON VELVET	28480	9300-0081
MP15	9300-0070	1	1	RIBBON VELVET	28480	9300-0070
MP16	00197-04117	0	1	COVER PC BOARD	28480	00197-04117
MP17	1400-0053	4	1	CLAMP CABLE 172 DIA 375 WD NYL	28480	1400-0053
MP18	00197-23709	5	1	SHAFT	28480	00197-23709
MP20	1000-0011	5	1	FILTER LENS UV	28480	1000-0011
MP21	00197-04802	0	1	GASKET BELLOWS	28480	00197-04802
MP22	5041-1546	4	1	BUTTON FOCUS LOCK	28480	5041-1546
MP23	0370-3022	7	1	KNOB	28480	0370-3022
MP24	00197-04803	1	1	GASKET BELLOWS	28480	00197-04803
MP25	00197-01218	6	1	BRACKET HOOD R	28480	00197-01218
MP25 (OPT 001)	00195-01201	5	1	BRACKET HOOD REAR	28480	00195-01201
MP26	5040-0431	2	1	ADAPTER-FILTER	28480	5040-0431
MP27	5020-0668	4	1	RETAINER MOUNT	28480	5020-0668
MP28	00197-64105	2	1	COVER ASSEMBLY-LH	28480	00197-64105
MP28 (OPT 007)	00197-04123	8	1	COVER LEFT HAND	28480	00197-04123
MP30	00197-00216	2	1	PANEL-SUB	28480	00197-00216
MP31	0460-0101	8	1	FOAM STRIP	28480	0460-0101
MP32	00197-05101	4	1	HINGE	28480	00197-05101
MP33	00197-62004	6	1	FRAME ASSEMBLY FRONT	28480	00197-62004
MP34	00197-62003	5	1	FRAME ASSEMBLY REAR	28480	00197-62003
MP35	00197-20603	2	2	TRIM CAMERA	28480	00197-20603
MP36	00197-00105	8	1	PLATE BOTTOM	28480	00197-00105
MP37	00197-60601	5	1	BELLOWS CAMERA	28480	00197-60601
MP38	7120-1192	6	1	LABEL INFO	28480	7120-1192
MP39	00197-04118	1	1	COVER MICROSWITCH	28480	00197-04118
MP40	00197-00106	9	1	HOOD VIEWING	28480	00197-00106
MP41	00197-22701	6	1	FILTER CAMERA UV	28480	00197-22701
MP42	00197-42301	4	2	RETAINER UV FILTER	28480	00197-42301
MP43	0460-1277	1	1	TAPE INDUSTRIAL	28480	0460-1277
MP44	00197-05401	7	1	INSULATOR POWER BOARD	28480	00197-05401
MP45	2110-0560	3	1	NUT FUSEHOLDER	28480	2110-0560
MP46	00197-64701	4	1	BOARD ASSEMBLY SHUTTER	28480	00197-64701
MP47	00197-41703	8	2	SUPPORT FRON.	28480	00197-41703
MP48	00197-23702	9	2	SHAFT CARRIAGE	28480	00197-23702
MP49	00197-41704	9	1	SUPPORT-LEFT REAR	28480	00197-41704
MP50	00197-41705	0	1	SUPPORT-RIGHT REAR	28480	00197-41705
MP51	00197-22403	5	2	GEAR DRIVE	28480	00197-22403
MP52	00197-05402	8	1	INSULATOR MICROSWITCH	28480	00197-05402
MP53	00197-41204	4	1	CLAMP CARRIAGE	28480	00197-41204
MP54	00197-22407	9	1	SCREW CLAMP	28480	00197-22407
MP55	0570-0164	6	1	SCREW MACH 6 32 5-IN LG PAN HD-SLT SST	28480	0570-0164
MP56	00197-48801	1	2	GROMMET	28480	00197-48801
MP57	00197-04106	7	1	COVER BOTTOM	28480	00197-04106
MP58	1000-0226	5	1	PLATE FOCUS	28480	1000-0226

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C	D	Qty	Description	Mfr Code	Mfr Part Number
MP60	0370-1099	4	1		KNOB BASE PTR 1/2 JGK 26 IN ID	28480	0370 1099
MP61	0370 2894	0	1		KNOB JADE GRAY	28480	0370 2894
MP62	00197 06403	9	1		INSULATOR SWITCH BOARD	28480	00197 06403
MP63	00197 01208	4	1		BRACKET MOUNTING FR RH	28480	00197 01208
MP64	00197 01210	8	1		BRACKET PINION	28480	00197 01210
MP65	00197 04703	0	1		SUPPORT PINION	28480	00197 04703
MP66	1410 0262	8	1		BEARING SLEEVE	28480	1410 0262
MP67	00197 01201	7	1		BRACKET GEAR MOUNTING	28480	00197 01201
MP68	0400 0067	9	3		BEARING SLV 188 ID 234 OD 078 LG NAL	86881	3LT FF
MP69	00197 22406	7	1		SHAFT SPLINED	28480	00197 22 06
MP70	00197 22401	3	1		GEAR BEVEL	28480	00197 22401
MP71	00197 23701	8	1		SHAFT	28480	00197 23701
MP72	00197 22402	4	1		GEAR BEVEL	28480	00197 22402
MP73	00197 01202	8	1		BRACKET BEZEL RETAINER	28480	00197 01202
MP74	00197 04120	5	1		COVER SWITCH BOARD	28480	00197 04120
MP75	00197 00214	0	1		PANEL CONTROL	28480	00197 00214
MP75 (OPT 001)	00197 00213	9	1		PANEL CONTROL	28480	00197 00213
MP77	00197 22202	2	1		BEZEL PANEL CONTROL	28480	00197 22202
MP77	7120 4101	1	1		TAG WARNING ALU.A	28480	7120 4101
MP78	00197 47402	6	1		LEVER SHTR RELEASE	28480	00197 47402
MP79	00197 04108	9	2		CUSHION FELT	28480	00197 04108
MP80	00197 04122	1	1		COVER RIGHT HAND	28480	00197 04122
MP81	00197 04804	2	1		GASKET SLIDING	28480	00197 04804
MP82	00197 66001	9	1		LOCK ASSEMBLY FOCUS	28480	00197 66001
MP86	1000 0702	2	1		LENS 76MM	28480	1000 0702
S1	3101 0200	1	1		SWITCH SENS SPDT MINTR 15A 250VAC	28480	3101 0200
S2	3101 0890	5	1		SWITCH TGL SUBMIN SPDT 2A 250VAC	28480	3101 0890
T1	9100 3968	8	1		TRANSFORMER POWER	28480	9100 3968
T1 (OPT 001)	9100 3438	7	1		TRANSFORMER POWER 115/230V 48 66HZ	28480	9100 3438
W1	8120 1378	1	1		CABLE ASSY 18AWG 3 CONDCT JGK JKT	28480	8120 1378
W1 (OPT 007)	8120 1892	5	1		CABLE ASSEMBLY (8 FT)	28480	8120 1892
W2	00197 61606	1	1		CABLE RIBBON	28480	00197 61606
*A1	00197 66500	3	1		BOARD ASSEMBLY POWER	28480	00197 66500
A1C1	0180 0104	7	1		CAPACITOR FXD 200UF +75-10% 16VDC AL	56289	30D207G016DF2
A1C2	0180 0094	4	1		CAPACITOR FXD 100UF +75-10% 25VDC AL	56289	30D107G025DD2
A1C3	0180 0141	2	1		CAPACITOR FXD 50UF +75-10% 50VDC AL	56289	30D506G050DD2
A1C4	0180 1784	1	1		CAPACITOR FXD 1000UF +75-10% 40VDC AL	28480	0180 1784
*A1C5	0180 0425	5	2		CAPACITOR FXD 4 7UF +150 10% 250VDC AL	28480	0180 0425
A1C6	0180 0425	1	1		CAPACITOR FXD 4 7UF +150 10% 250VDC AL	28480	0180 0425
A1C7	0160 3665	9	1		CAPACITOR FXD 01UF +80 20% 500VDC CER	28480	0160 3665
A1CR1	1901 0045	6	6		DIODE PWR RECT 100V 750MA DO 29	28480	1901 0045
A1CR2	1901 0045	5	1		DIODE PWR RECT 100V 750MA DO 29	28480	1901 0045
A1CR3	1901 0045	6	1		DIODE PWR RECT 100V 750MA DO 29	28480	1901 0045
A1CR4	1901 0045	6	1		DIODE PWR RECT 100V 750MA DO 29	28480	1901 0045
A1CR5	1901 0045	6	1		DIODE PWR RECT 100V 750MA DO 29	28480	1901 0045
A1CR6	1901 0045	6	1		DIODE PWR RECT 100V 750MA DO 29	28480	1901 0045
A1CR7	1901 0028	5	2		DIODE PWR RECT 400V 750MA DO 29	28480	1901 0028
*A1CR8	1901 0028	5	1		DIODE PWR RECT 400V 750MA DO 29	28480	1901 0028
A1Q1	1854 0063	5	1		TRANSISTOR NPN 2N2218 SI TO 5 PD 800MW	04713	2N2218
A1Q2	1854 0072	8	1		TRANSISTOR NPN 2N3054 SI TO 66 PD 25W	01928	2N3054
A1R1	0681 1011	5	1		RESISTOR 100 10% 25W FC TC -400 +500	01121	CB1011
A1R2	0687 1211	3	1		RESISTOR 120 10% 5W CC TC -0-520	01121	EB1211
A1R3	0761 0037	7	1		RESISTOR 330 5% 1W MO TC -0-200	28480	0761 0037
A1R4	0687 4701	2	1		RESISTOR 47 10% 5W CC TC -0-412	01121	EB4701
A1VR1	1902 0026	5	1		DIODE 2NR 36 5V 10% DO 35 PD 4W	28480	1902 0026
A2	00197 66604	9	1		SWITCH BOARD ASSEMBLY	28480	00197 66604
A2C1	0150 0023	6	1		CAPACITOR FXD 2000PF ±20% 1KVDC CER	72982	808 45U0 202M1KV
A2C2	0160 0168	1	1		CAPACITOR FXD 1UF ±10% 200VDC POLYE	28480	0160 0168
A2C3	0160 3451	1	2		CAPACITOR FXD 01UF +80-20% 100VDC CER	28480	0160 3451
A2C4	0160 3451	1	1		CAPACITOR FXD 01UF +80-20% 100VDC CER	28480	0160 3451
A2C5	0160 0820	2	1		CAPACITOR FXD 05UF +80-20% 25VDC CER	28480	0160 0820
A2C6	0180 0116	1	1		CAPACITOR FXD 68UF ±10% 35VDC TA	56289	160D685X9036B2

*FOR STANDARD A1 BOARD ORDER A1C5, A1C6, AND A1CR8 SEPARATELY
FOR OPTION 001 A1 BOARD ORDER A1CR8 SEPARATELY

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2C7	0180 2358	7	1	CAPACITOR FXD .150UF $\pm 5\%$ 50VDC TA	86280	150D157X5006R2
A2C8	0150 3558	0	1	CAPACITOR FXD .1UF $\pm 20\%$ 50VDC CER	28480	0150 3558
A2CR1	1910 0016	0	2	DIODE GE 60V 60MA 1US DO-7	28480	1910 0016
A2CR2	1910 0016	0	0	DIODE GE 60V 60MA 1US DO-7	28480	1910 0016
A2E1	00197 61902	1	1	ROTOR ASSEMBLY	28480	00197 61902
A2E2	00197 61903	2	1	ROTOR ASSEMBLY	28480	00197 61903
A2MP1	0510 1101	7	1	RETAINER RING BWD E EXT .33 IN DIA BE CU	28480	0510 1101
A2MP2	01840 22502	7	1	ROLLER DETENT	28480	01840 22502
A2Q1	1854 0071	7	1	TRANSISTOR NPN 51 PD-300MW FT-200MHZ	28480	1854 0071
A2Q2	1854 0083	5	1	TRANSISTOR NPN 2N221B 51 TO 5 PD-800MW	04713	2N221B
A2R1	0684 1001	3	1	RESISTOR 10 10% 25W FC TC-400 ± 600	01121	CH1001
A2R2	0684 1061	3	1	RESISTOR 1M 10% 25W FC TC-800 ± 600	01121	CB1061
A2R3	0757 0472	5	1	RESISTOR 200K 1% 125W F TC-0 ± 100	24546	C4 1/8 TO 2003 F
A2R4	0761 0037	7	1	RESISTOR 390 5% 1W MO TC-0 ± 200	28480	0761 0037
A2U1	1810 0220	6	1	NETWORK RES 12 SIP MULTI-VALUE	28480	1810 0220
A2U2	1820 0261	6	1	IC MV TTL MONOSTBL	01205	EN74121.4
A2VR1	1902 3104	6	1	DIODE 2NR 5.62V 5% DO 35 PD-4W	28480	1902 3104
A2XU2	1200 0638	7	1	SOCKET IC 14 CONT DIP DIP-5LDR	28480	1200 0638
A3	00197 66509	4	1	BOARD ASSEMBLY UV	28480	00197 66509
A3R1	0698 3540	8	4	RESISTOR 15 4K 1% 125W F TC-0 ± 100	24546	C4 1/8 TO 1542 F
A3R2	0698 3540	8	4	RESISTOR 15 4K 1% 125W F TC-0 ± 100	24546	C4 1/8 TO 1542 F
A3R3	0757 0458	7	4	RESISTOR 51 1K 1% 125W F TC-0 ± 100	24546	C4 1/8 TO 5112 F
A3R4	0757 0458	7	4	RESISTOR 51 1K 1% 125W F TC-0 ± 100	24546	C4 1/8 TO 5112 F
A3R5	0698 3540	8	4	RESISTOR 15 4K 1% 125W F TC-0 ± 100	24546	C4 1/8 TO 1542 F
A3R6	0698 3540	8	4	RESISTOR 15 4K 1% 125W F TC-0 ± 100	24546	C4 1/8 TO 1542 F
A3R7	0757 0458	7	4	RESISTOR 51 1K 1% 125W F TC-0 ± 100	24546	C4 1/8 TO 5112 F
A3R8	0757 0458	7	4	RESISTOR 51 1K 1% 125W F TC-0 ± 100	24546	C4 1/8 TO 5112 F
A3V1	2140 0135	2	2	UV LAMP	28480	2140 0135
A3V2	2140 0135	2	2	UV LAMP	28480	2140 0135
A4	10376A	2	1	CAMERA ADAPTOR KIT	28480	10376A
AA (OPT 002)	10378A	4	1	CAMERA ADAPTOR - 197B	28480	10378A
AA (OPT 006)	10375A	1	1	CAMERA ADAPTOR	28480	10375A
A4H1	2190 0018	5	1	WASHER LK HLCL NO. 6 141 IN ID	28480	2190 0018
A4H1 (OPT 002)	2190 0018	5	1	WASHER LK HLCL NO. 6 141 IN ID	28480	2190 0018
A4H1 (OPT 006)	2190 0018	5	1	WASHER LK HLCL NO. 6 141 IN ID	28480	2190 0018
A4H2	2190 0469	0	1	WASHER LK INTL T NO. 4 116 IN ID	28480	2190 0469
A4H2 (OPT 002)	2190 0469	0	1	WASHER LK INTL T NO. 4 116 IN ID	28480	2190 0469
A4H2 (OPT 006)	2190 0469	0	2	WASHER LK INTL T NO. 4 116 IN ID	28480	2190 0469
A4H3	2200 0163	4	1	SCREW MACH 4 40 375 IN LG TR HD SLT	00000	ORDER BY DESCRIPTION
A4H3 (OPT 002)	2200 0163	4	1	SCREW MACH 4 40 375 IN LG TR HD SLT	00000	ORDER BY DESCRIPTION
A4H3 (OPT 006)	2200 0163	4	1	SCREW MACH 4 40 375 IN LG TR HD SLT	00000	ORDER BY DESCRIPTION
A4H4 (OPT 006)	0510 0715	7	1	RETAINER RING BWD E EXT .188 IN DIA STL	28480	0510 0715
A4H5 (OPT 006)	1480 0233	0	1	PIN SPL 125 IN DIA .5 IN LG SST	28480	1480 0233
A4H6 (OPT 006)	2510 0118	5	2	SCREW MACH 8 32 .5 IN LG 100 DEG	00000	ORDER BY DESCRIPTION
A4H7 (OPT 006)	2510 0124	4	2	SCREW MACH 8 32 .625 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
A4H8 (OPT 006)	2510 0271	2	2	SCREW MACH 8 32 .75 IN LG 82 DFG	00000	ORDER BY DESCRIPTION
A4H9 (OPT 002)	0510 0956	8	1	RING RETAINING O 188 SHAFT	79136	133-18 MD
A4H10 (OPT 002)	1480 0012	3	1	PIN ROLL .078 IN DIA .25 IN LG STL	28480	1480 0012
A4H11 (OPT 002)	1480 0310	4	1	PIN GRV ANSI TYP A .062 IN DIA	28480	1480 0310
A4H12 (OPT 002)	2200 0160	1	1	SCREW MACH 4 40 125 IN LG PAN HD SLT	00000	ORDER BY DESCRIPTION
A4H13 (OPT 002)	2360 0178	8	1	SCREW MACH 6 32 125 IN LG BDG HD SLT	00000	ORDER BY DESCRIPTION
A4H14 (OPT 002)	2680 0115	2	2	SCREW MACH 10 24 375 IN LG 100 DEG	00000	ORDER BY DESCRIPTION
A4MP1	1460 0278	1	1	SPRING CPRSN 298 IN OD .56 IN OA LG MUW	28480	1460 0278
A4MP1 (OPT 002)	1460 0278	1	1	SPRING CPRSN 298 IN OD .56 IN OA LG MUW	28480	1460 0278
A4MP1 (OPT 006)	1460 0278	1	1	SPRING CPRSN 298 IN OD .56 IN OA LG MUW	28480	1460 0278
A4MP2	00197 25001	6	1	LATCH	28480	00197 25001
A4MP2 (OPT 002)	00197 25001	5	1	LATCH	28480	00197 25001
A4MP2 (OPT 006)	00197 25001	6	1	LATCH	28480	00197 25001
A4MP3	00197 27401	3	1	BUTTON LATCH	28480	00197 27401
A4MP3 (OPT 002)	00197 27401	3	1	BUTTON LATCH	28480	00197 27401
A4MP3 (OPT 006)	00197 27401	3	1	BUTTON LATCH	28480	00197 27401
A4MP4	10106 64101	0	1	PLATE ASSEMBLY LOCKING	28480	10106 64101
A4MP5	10376 23201	1	1	CAMERA ADAPTOR	28480	10376 23201
A4MP5 (OPT 002)	00197 22006	4	1	MOUNT CAMERA	28480	00197 22006
A4MP5 (OPT 006)	00197 22006	6	1	MOUNT CAMERA	28480	00197 22006

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
AAMP6 (OPT 006)	9300 0081	4	3	RIBBON VELVET	28480	9300 0081
AAMP7 (OPT 006)	00197 00611	1	1	GASKET	28480	00197 00611
AAMP8 (OPT 006)	00197 01214	2	1	BRACKET-BEZEL	28480	00197 01214
AAMP9 (OPT 006)	00197 01216	4	1	RETAINER	28480	00197 01216
AAMP10 (OPT 006)	00197 04705	2	1	SPACER MOUNT	28480	00197 04705
AAMP11 (OPT 006)	00197 22411	5	1	SCREW CAMERA BRACKET	28480	00197 22411
AAMP12 (OPT 002)	0370 0190	4	1	KNOB 625 IN OD 187 DIA SHAFT	28480	0370 0190
AAMP13 (OPT 002)	00197 01206	1	1	RETAINER MOUNT	28480	00197 01206
AAMP14 (OPT 002)	00197 01206	2	1	RETAINER MOUNT	28480	00197 01206
AAMP15 (OPT 002)	00197 04701	8	1	GASKET CAMERA MOUNT	28480	00197 04701
AAMP16 (OPT 002)	00197 04702	9	1	GASKET WIPER MOUNT	28480	00197 04702
AAMP17 (OPT 002)	00197 04704	1	1	GASKET WIPER MOUNT	28480	00197 04704
AAMP18 (OPT 002)	00197 04801	8	1	WIPER MOUNT	28480	00197 04801
AAMP19 (OPT 002)	00197 22408	0	1	GEAR WORM	28480	00197 22408
AAMP20 (OPT 002)	00197 22410	4	1	GEAR WORM	28480	00197 22410
AAMP21 (OPT 002)	00197 23704	1	1	SHAFT	28480	00197 23704
AAMP22 (OPT 002)	00197 25002	6	1	LEVER MOUNTING	28480	00197 25002
AAMP23 (OPT 002)	00197 41001	9	1	FOOT LEVER	28480	00197 41001
AAMP24 (OPT 002)	00197 41002	0	1	FOOT CENTER	28480	00197 41002
AAMP25 (OPT 002)	00197 41003	1	1	FOOT RIGHT	28480	00197 41003
AAMP26 (OPT 002)	00197 41004	2	1	FOOT LEFT	28480	00197 41004
A5	10353B	7	1	CAMERA BACK	28480	10353B
A5 (OPT 003)	1C352B	6	1	CAMERA BACK	28480	10352B
A5H1	0624 0307	4	8	SCREW-TPG 2 28 25-IN LG PAN HD PHL STL	28480	0624 0307
A5MP1	1000 0517	7	1	CAMERA BACK	28480	1000 0517
A5MP2	5041-3030	5	1	ADAPTER	28480	5041-3030
A5MP3	10353-22401	4	2	SCREW LOCK	28480	10353-22401
A6	00197 68501	2	1	SHUTTER ASSEMBLY	28480	00197 68501
A6E6	00197 49103	8	1	CONTROL ASSEMBLY SYNC	28480	00197 49103
A6H1	0517 0007	4	8	SCREW MACH 1-64 72-IN LG B2 DEG	801	ORDER BY DESCRIPTION
A6H2	0509 0003	5	8	NUT HEX DBL CHAM 1 64 THD 047 IN THK	70318	ORDER BY DESCRIPTION
A6H3	2210 0003	2	1	SCREW MACH 4 40 375 IN LG B2 DEG	80120	ORDER BY DESCRIPTION
A6L1	5080 0471	4	1	SOLENOID SELECT	28480	5080 0471
A6MP1	00197 40201	9	1	SHUTTER FRONT	28480	00197 40201
A6MP2	00197 09106	5	1	CRIMPED COPPER WASHER	28480	00197 09106
A6MP3	00197 06801	7	1	FLAT COPPER WASHER	28480	00197 06801
A6MP4	NSR	1	1	SHUTTER BEARING CAP	28480	
A6MP10	00197 22011	1	1	POD SHUTTER	28480	00197 22011
A6MP19	0380 1186	2	1	SPACER SPECIALTY 1 IN OD, 0.562 IN ID	28480	0380 1186
A6MP28	00197 22404	6	1	GEAR IDLER	28480	00197 22404
A6MP60	00197 69506	7	1	SHUTTER BLADE ASSEMBLY	28480	00197 69506
A6MP83	00197 21702	5	1	BUSHING REAR	28480	00197 21702
A4	10376A	2	1	CAMERA ADAPTOR KIT	28480	10376A
AAH1	1100 0018	5	1	WASHER LK HLCL NO 6 141 IN ID	28480	2190 0018
AAH2	2190 0469	0	1	WASHER LK INTL T NO 4 116 IN ID	28480	2190 0469
AAH3	2200 0183	4	1	SCREW MACH 4 40 375 IN LG TR HD SLT	00000	ORDER BY DESCRIPTION
AAH4	1460 0278	1	1	SPRING CPRSN 298 IN OD 56 IN OA LG MUW	28480	1460 0278
AAH5	00197 25001	5	1	LATCH	28480	00197 25001
AAH6	00197 27401	3	1	BUTTON LATCH	28480	00197 27401
AAH7	10106 64101	0	1	PLATE ASSEMBLY-LOCKING	28480	10106 64101
AAH8	10376 23201	1	1	CAMERA ADAPTOR	28480	10376 23201
AAH9	10376A	4	1	CAMERA ADAPTOR - 197B	28480	10376A
AAH10	2190 0018	5	1	WASHER LK HLCL NO 6 141 IN ID	28480	2190 0018
AAH11	2190 0469	0	1	WASHER LK INTL T NO 4 116 IN ID	28480	2190 0469
AAH12	2200 0183	4	1	SCREW MACH 4 40 375 IN LG TR HD SLT	00000	ORDER BY DESCRIPTION
AAH13	0510 0956	8	1	RING, RETAINING 0 188 IN SHAFT	79136	133 18 MD
AAH14	1480 0012	3	1	PIN ROLL 078 IN DIA 25 IN LG STL	28480	1480 0012
AAH15	1480 0310	4	1	PIN GRV ANSI-TYP-A 062 IN DIA	28480	1480 0310
AAH16	2200 0160	1	1	SCREW MACH 4 40 125 IN LG PAN HD SLT	00000	ORDER BY DESCRIPTION
AAH17	2360 0178	9	1	SCREW MACH 6-32 125 IN LG 80G HD SLT	00000	ORDER BY DESCRIPTION
AAH18	2680 0115	2	2	SCREW MACH 10-24 375 IN LG 100 DEG	00000	ORDER BY DESCRIPTION
AAH19	1460 0278	1	1	SPRING CPRSN 298 IN OD 56 IN OA LG MUW	28480	1460 0278
AAH20	00197 25001	5	1	LATCH	28480	00197 25001
AAH21	00197 27401	3	1	BUTTON LATCH	28480	00197 27401
AAH22	00197 22006	4	1	MOUNT CAMERA	28480	00197 22006
AAH23	0370 0190	4	1	KNOB 625 IN OD 187 DIA SHAFT	28480	0370 0190

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
AAMP13	00197 01206	1	1	RETAINER MOUNT	28480	00197 01206
AAMP14	00197 01206	2	1	RETAINER MOUNT	28480	00197 01206
AAMP15	00197 04701	8	1	GASKET CAMERA MOUNT	28480	00197 04701
AAMP16	00197 04702	9	1	GASKET WIPER MOUNT	28480	00197 04702
AAMP17	00197 04704	1	1	GASKET WIPER MOUNT	28480	00197 04707
AAMP18	00197 04801	9	1	WIPER MOUNT	28480	00197 04801
AAMP19	00197 22408	0	1	GEAR WORM	28480	00197 22408
AAMP20	00197 22410	4	1	GEAR WORM	28480	00197 22410
AAMP21	00197 23704	1	1	SHAFT	28480	00197 23704
AAMP22	00197 25002	6	1	LEVER MOUNTING	28480	00197 25002
AAMP23	00197 41001	9	1	FOOT LEVER	28480	00197 41001
AAMP24	00197 41002	0	1	FOOT CENTER	28480	00197 41002
AAMP25	00197 41003	1	1	FOOT RIGHT	28480	00197 41003
AAMP26	00197 41004	2	1	FOOT LEFT	28480	00197 41004
OPTION 005						
AA	10375A	1	1	CAMERA ADAPTOR	28480	10375A
AAH1	2190 0018	5	1	WASHER LK HCL NO 5 141 IN ID	28480	2190 0018
AAH2	2190 0469	0	2	WASHER LK INTL T NO 4 116 IN ID	28480	2190 0469
AAH3	2200 0153	4	1	SCREW MACH 4 40 376 IN LG TR HD 5LT	00000	ORDER BY DESCRIPTION
AAH4	0510 0715	7	1	RETAINER RING BWD E EXT 188 IN DIA STL	28480	0510 0715
AAH5	1480 0233	0	1	PIN SPL 126 IN DIA 5 IN LG 55T	28480	1480 0233
AAH6	2510 0118	6	2	SCREW MACH 8 32 5 IN LG 100 DEG	00000	ORDER BY DESCRIPTION
AAH7	2510 0124	4	2	SCREW MACH 8 32 625 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
AAH8	2510 0271	2	2	SCREW MACH 8 32 75 IN LG 82 DEG	00000	ORDER BY DESCRIPTION
AAMP1	1460 0278	1	1	SPRING CPRSN 298 IN OD 56 IN OA LG MUW	28480	1460 0278
AAMP2	00197 25001	5	1	LATCH	28480	00197 25001
AAMP3	00197 27401	3	1	BUTTON LATCH	28480	00197 27401
AAMP5	00197 22008	6	1	MOUNT CAMERA	28480	00197 22008
AAMP6	9300 0081	4	3	RIBBON VELVET	28480	9300 0081
AAMP7	00197 00611	1	1	GASKET	28480	00197 00611
AAMP8	00197 01214	2	1	BACKET BEZEL	28480	00197 01214
AAMP9	00197 01216	4	1	RETAINER	28480	00197 01216
AAMP10	00197 04705	2	1	SPACER MOUNT	28480	00197 04705
AAMP11	00197 22411	5	1	SCREW CAMERA BRACKET	28480	00197 22411
STANDARD						
A5	10353B	7	1	CAMERA BACK	28480	10353B
A5H1	0624 0307	4	8	SCREW TPG 2-28 25 IN LG PAN HD PHL STL	28480	0624 0307
A5MP1	1000 0517	7	1	CAMERA BACK	28480	1000 0517
A5MP2	5041 3030	5	1	ADAPTER	28480	5041 3030
A5MP3	10353 27401	4	2	SCREW LOCK	28480	10353 27401
OPTION 003						
A5	10352B	5	1	CAMERA BACK	28480	10352B

Table 6-3. List of Manufacturer's Codes

Mfr Code	Manufacturer Name	Address	Zip Code
00000	ANY SATISFACTORY SUPPLIER		
01121	ALLEN-BRADLEY CO	MILWAUKEE WI	53204
01295	TEXAS INSTR INC SEMICOND COMPNT DIV	DALLAS TX	75222
01928	NCA CORP SOLID STATE DIV	SOMERVILLE NJ	08876
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85062
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	16701
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
55289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	C1247
72982	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE PA	16512
75915	LITTELFUSE INC	DES PLAINES IL	60016
79136	WALDES-KOHINDOR INC	LG ISLAND CITY NY	11101
96881	THOMSON INDUSTRIES INC	MANHASSET NY	11030
H9027	SCHURTER A G H	LUZERN SWITZ	

BACK DATING MANUAL CHANGES

SECTION VII

MANUAL CHANGES

7-1. INTRODUCTION.

7-2. This section normally contains information for adapting this manual to instruments for which the content does not apply directly. Since this manual does

apply directly to instruments having the serial number listed on the title page, no change information is given here. Refer to **INSTRUMENTS COVERED BY MANUAL** in Section I for additional important information about serial number coverage.

SERVICE INFORMATION

SECTION VIII

SERVICE

8-1. INTRODUCTION.

8-2. This section provides instructions for troubleshooting and repairing the Model 197B Oscilloscope Camera.

8-3. Detailed theory of operation and troubleshooting information is located opposite the schematic on a foldout Service Sheet. The remainder of this section has general service information that should help you quickly service and repair the 197B.

8-4. THEORY OF OPERATION.

8-5. Overall theory of operation is on pages opposite the block diagram (Service Sheet 1). Detailed theory, schematics, and troubleshooting information are presented in Service Sheet 2. Table 8-1 explains any unusual symbols used on the schematics.

8-6. TROUBLESHOOTING.**WARNING**

Maintenance described in this section is performed with power supplied to the instrument and with protective covers removed. Maintenance should be performed only by trained service personnel who are aware of the hazards involved (for example, fire and electrical shock). Where maintenance can be performed without power applied, the power should be removed. Read the Safety Summary at the front of this manual before attempting repair on this instrument.

8-7. Troubleshooting the instrument consists of a thorough visual inspection, and then an electrical check if necessary. During the visual inspection, look for loose, broken, or binding mechanical components; loose or discolored electrical components or wiring; or any other similar condition that might indicate a source of trouble. Repair any faulty component or connection that is encountered during the visual inspection and check instrument performance before continuing to troubleshoot the instrument.

8-8. If no obvious fault is located during the visual inspection then use the block diagram and the schematic as aids in trouble isolation. Check dc voltages as shown on the schematic to further isolate the problem.

8-9. PREVENTIVE MAINTENANCE.

8-10. Preventive maintenance consists of periodic performance checks, mechanical inspection, lubrication, and other services designed to prevent breakdown and failure. Performance checks and adjustments are covered in Section IV of this manual. Other preventive maintenance services are covered in the following paragraphs.

8-11. MECHANICAL INSPECTION. Periodically inspect the instrument for damaged components, excess grease, dirt, and corrosion. Look for loose and misaligned parts. Ensure that all screws and fasteners are tight and serviceable.

8-12. Painted surfaces can be cleaned with a commercial, spray-type, window cleaner or with a mild soap and water solution. Excess grease can be removed with a degreaser such as M-180 FREON TF DEGREASER produced by Miller-Stevenson Company.

8-13. Corroded spots can be removed with soap and water. Stubborn residues can best be removed with a fine abrasive. When using abrasives, be careful that fine particles do not fall into the instrument. Such areas should be protected from further corrosion by an application of a silicone resin such as GE DRI-FILM 88 produced by General Electric Company.

8-14. SWITCH MAINTENANCE. Rotary switches can easily be serviced after removal from the instrument. Conventional rotary switches are serviced by cleaning the contacts with a degreaser such as M-180 FREON TF DEGREASER. Contact surfaces should be lubricated with a lubricant comparable to LUBRIPLATE FML produced by the Fiske Brothers Refining Company. LUBRIPLATE FML is available from Hewlett-Packard (HP Part No. 6040-0305).

8-15. CAMERA BACK CLEANING. The entire camera back interior should be inspected and if necessary cleaned, prior to installing a new film pack. In particular, it should be inspected for residue from any developer reagent that may have spilled. The residue should be carefully wiped off with a damp cloth to avoid scratching or spotting subsequent prints. Use a non-metallic object to dislodge any dried reagent.

8-16. LENS CLEANING. Both lens and filter should be inspected regularly and cleaned as necessary. For cleaning, use lens tissue or, for heavy smudges or grease spots (such as fingerprints), a commercial lens cleaner.

Table 8-1. Schematic Notes

Resistance in ohms, capacitance in picofarads, inductance in microhenries unless otherwise noted.

*

Asterisk denotes a factory-selected value. Value shown is typical. Part may be omitted.



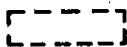
Tool-aided control or adjustment.



Manual control or adjustment.



Encloses front-panel designation.



Encloses rear-panel designation.



Circuit assembly borderline.



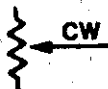
Other assembly borderline. Also used to indicate mechanical interconnection (ganging).



Heavy line with arrows indicates path and direction of main signal.



Heavy dashed line with arrows indicates path and direction of main feedback.



Wiper moves toward CW with clockwise rotation of control (as viewed from shaft or knob).



Numbered Test point. Measurement aid provided.



Lettered Test point. No measurement aid provided.



Encloses wire color code. Code used is the same as the resistor color code. First number identifies the base color, second number identifies the wider stripe, third number identifies the narrower stripe. E.g., (947) denotes white base, yellow wide strip, violet narrow stripe.



A direct conducting connection to the earth, or a conducting connection to a structure that has a similar function (e.g., the frame of an air, sea, or land vehicle).



A conducting connection to a chassis or frame.



Common connections. All like-designated points are connected.

When cleaning the lens avoid excessive pressure which could affect the lens coating.

8-17. LUBRICATION. Periodic lubrication of the camera is not required. If there is a noticeable binding at any of the points listed in table 8-2, a small amount of lubricant should be applied.

8-18. REPAIR AND REPLACEMENT.

8-19. Repair of the Model 197B consists of replacing defective components located during troubleshooting. The following paragraphs provide information about access to instrument components and special servicing information for etched circuit boards.

CAUTION

When replacing components mounted on the welded aluminum studs, i.e., brackets, covers, and pc board, do not tighten nuts to more than 0.545 newton-metres (5 inch-pounds) torque.

8-20. SIDE PANEL ACCESS. Both side panels can be detached from the camera frame for access to components. When detached, the side panels will lay flat and the frame may be removed and set aside. The panels are, however, still connected together by the ribbon cable which must be removed before complete separation of the panels is achieved. To detach the side panels from the camera frame, proceed as follows:

- a. Remove bottom cover (6 screws).
- b. Remove FOCUS ⑪ and LOCK knobs ⑫ (note position of LOCK knob).

Table 8-2. Camera Lubrication Points

Location	Recommended Lubricant
Mounting lock worm gear	Lubriplate
Carriage shafts (2 places)	Graphite powder
Carriage drive gears (2 places)	Graphite powder
Carriage lock drive	Lubriplate
Reduction ratio screw	Lubriplate
Iris drive gears	Lubriplate
f/stop bevel gear	Lubriplate

c. Open mounting frame.

d. Remove three screws on left side of camera front ⑩ (for right hand cover).

e. Press front of right-hand cover ⑪ from inside of camera until cover is clear of camera frame, then pull forward to disengage cover from guide pins on rear of frame (See Figure 8-1).

f. Remove three screws (first, third, and fifth) from right side of camera front ⑫ for left-hand cover (See Figure 8-2).

g. Press front of left-hand cover ⑬ from inside of camera until cover is clear of camera frame, then pull forward to disengage cover from guide pins on rear of frame.

h. Reverse procedure to replace side panels.

NOTE

Disengage cable grommet MP56 from camera frame if panels are to be separated from frame (See Figure 8-3).

CAUTION

When replacing side panels, ensure that splined shaft (MP69) and iris idler gear (MP29) are mated correctly.

i. When side panels are replaced, accomplish LENS f/NO. adjustment as described in Section V.

8-21. SHUTTER BLADE REMOVAL PROCEDURE. The shutter blade assembly can be replaced using the following procedure:

- a. Remove side panels as described in section 8-20.
- b. Remove the two screws H24 and H20 that attach the shutter assembly to the shutter board assembly.
- c. Remove idler gear screw H36.
- d. Thread the solenoid harness thru the shutter board assembly to access the shutter assembly.
- e. Remove MP88 lenses to avoid surface damage.
- f. Remove the eight A6H1 screws.

CAUTION

Do not remove the flat head Pozidriv screw from the center of the shutter assembly or the iris blades may fall out.

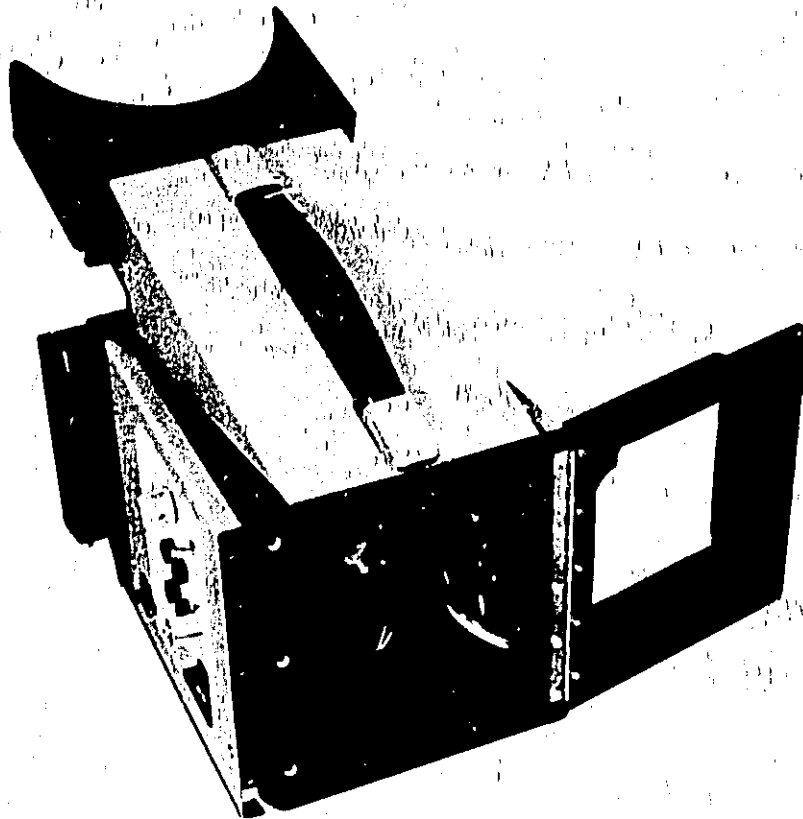


Figure 8-1. Right-hand Cover Removal

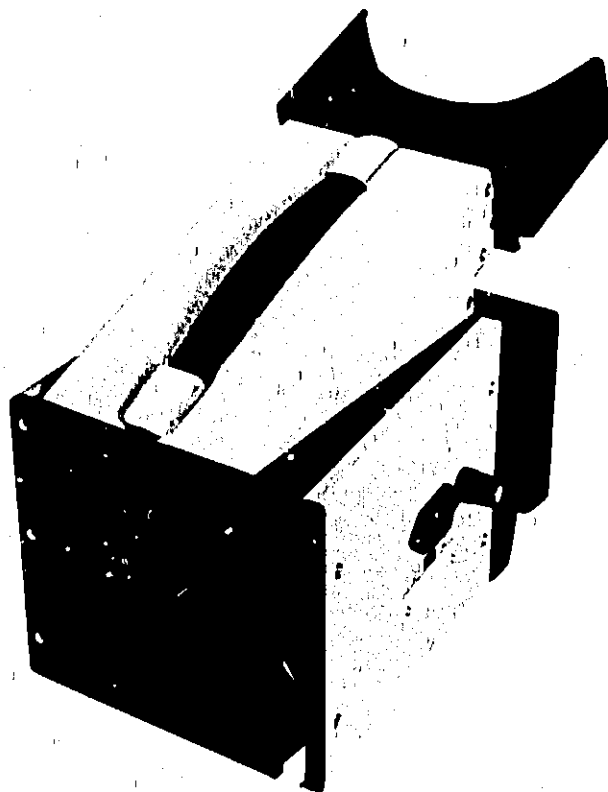


Figure 8-2. Left-hand Cover Removal

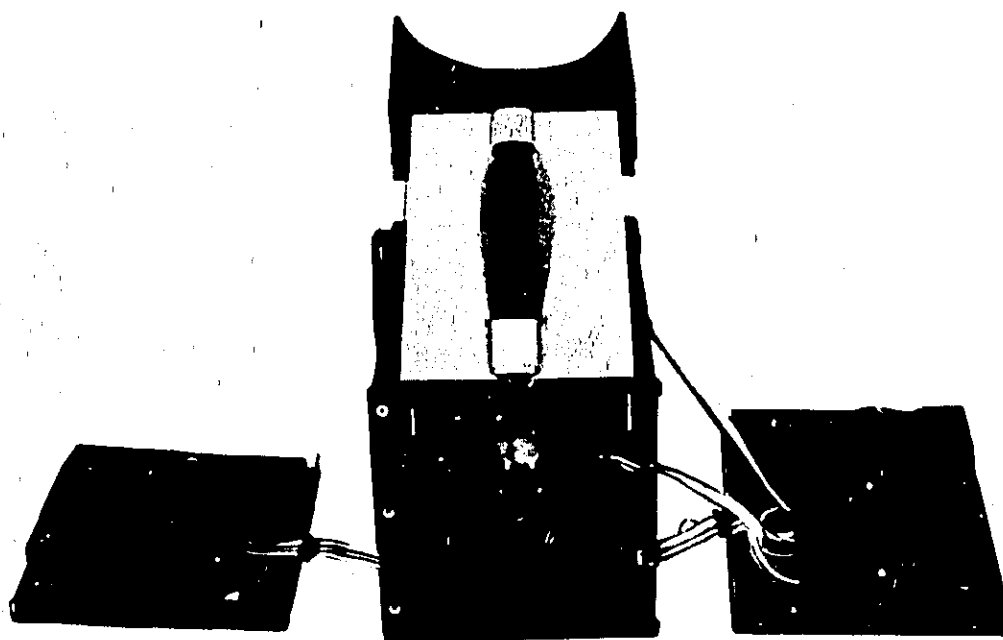


Figure 8-3. Internal Access

- g. Remove the A6MP1 Shutter Front.
- h. Remove A6H3 screw.
- i. Replace shutter blade.
- j. Reassemble and make the adjustment described in Section V.

8-22. SERVICING ETCHED CIRCUIT BOARDS. The etched circuit boards have plated through component holes. This allows components to be removed or replaced by unsoldering or soldering from either side of the board. When removing large components such as potentiometers, rotate the soldering iron tip from lead to lead while applying pressure to the part to lift it from the board. HP Service Note M-20E contains additional information for repair of etched circuit boards.

8-23. When removing or installing a semiconductor, use long-nosed pliers as a heat sink between the device and the soldering iron. When replacing a semiconductor, ensure sufficient lead length to dissipate the soldering heat by using the same length of exposed lead as used for the original part.

8-24. PRINT QUALITY IMPROVEMENT.

8-25. Most problems encountered in oscilloscope photography involve incorrect control settings or conditions of operation. These problems can often be avoided

by following the mounting instructions in Section II, and the operating information in Section III. Some of the most common problems are discussed in the following paragraphs.

8-26. LIGHT LEAKAGE. Check for light leakage in the camera as follows:

- a. Mount camera on oscilloscope, and apply power to camera.
- b. Verify that there is no display on oscilloscope.
- c. Set SHUTTER SPEED selector switch ① to 1 second.
- d. Set LENS f/NO. control ② to 1.9.
- e. Press SHUTTER control bar ③ and develop resulting photograph.
- f. Resulting print should be completely black.

8-27. FOGGING. Fogging or undesirable light areas over all or part of the print can be caused by many factors. The two main causes are internal (within the oscilloscope) or external light leakage.

8-28. Internal Sources. Many causes of fogging originate in the oscilloscope itself. These problems can

become difficult to control, especially when time exposures are required. Some of the most common faults are:

a. Excessive brilliance can cause general "blooming" of the trace which tends to illuminate the entire screen. This can be corrected by decreasing display intensity.

b. Orange-yellow light emitted from cathode of unaluminized CRT can cause fogging on time exposures. A blue filter over the CRT face or camera lens may help reduce this type of fogging.

c. An unblanked oscilloscope can also cause fogging, especially if it is being used for recording transients, since the spot remains visible until a transient occurs. This problem can be minimized by positioning the spot to a point just off the display area, or by masking the spot with a small piece of tape.

8-29. External Sources. External light leakage is another common cause of film fogging. Some common sources are:

a. Improper mounting may not permit mounting frame light gasket to seat firmly against bezel.

b. A loose fitting bezel may permit stray light to enter edge of CRT face (or external graticule). Masking bezel edges will usually solve this problem.

c. Light entering CRT area internally through instrument cover perforations is more difficult to eliminate. Reduction of ambient light will probably be the most practical.

CAUTION

If a black cloth (or any other type of covering) is used over the instrument for reduction of ambient light, do not cut off air circulation to the instrument.

8-30. FILM TEARING. Film damage due to tearing is usually caused by not pulling the yellow tab straight out when advancing the film. The tab should be pulled in a straight line parallel with the long axis of the camera back.

8-31. PRINT IMPERFECTIONS. Dark spots appearing at the same place on successive exposures may be caused by dust on the lens or filter. White spots on the print can be caused by an accumulation of developer residue or foreign matter on the pressure rollers in the camera back. Keeping the lens and inside of the camera back clean will eliminate many imperfections (refer to paragraph 8-15 for cleaning recommendations). A diagonal pattern on all prints indicates that the pressure rollers are worn or damaged.

8-32. GENERAL INSTRUMENT DESCRIPTION.

8-33. CAMERA BACK.

The 197B uses a camera back manufactured by the Polaroid Land Corporation. The camera back holds the film-pack and is mounted to the frame of the 197B. The film-development process is initiated within this unit.

The film-development process is illustrated in figure 8-4. For simplicity, only one negative and one positive are shown. The pressure plate presses the negative stack firmly against the front of the film-pack cover so that the top negative in the stack lies flat in the film plane. After exposure, the white tab is pulled. This positions the exposed negative over the top positive of the positive stack. At the same time, the white tab for the next exposure (not shown) appears at the opening, while the yellow tab is advanced through a second opening. Pulling the yellow tab causes the developer reagent pod to rupture when it passes between the pressure rollers. As the film is drawn out of the camera, the reagent spreads in a thin layer between the positive and negative papers and reacts with the chemicals on these

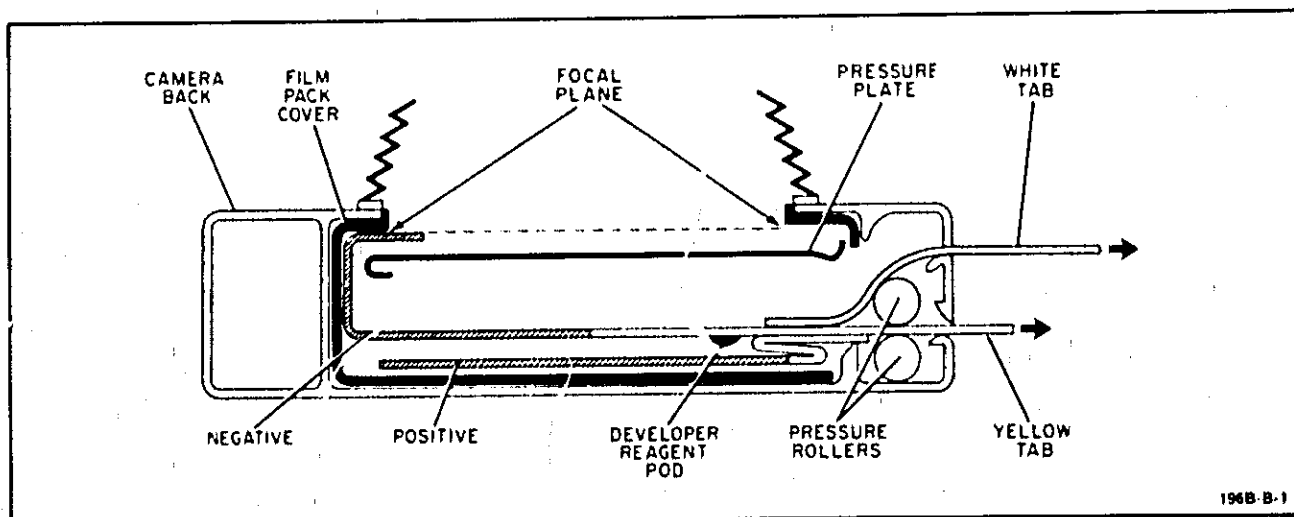


Figure 8-4. Camera Back Operation

papers. The finished photograph is removed by peeling the print from the negative. The print must then be coated for permanence using the coater supplied with the film pack.

8-34. LENS ASSEMBLY.

The 197B has an $f/1.9$ lens with a focal length of 75 mm (3 in.). The lens is especially corrected for use in oscilloscope photography to give minimum distortion over the full image area, and to give a flat field of focus. It is positioned at the factory to produce a 1:0.9 object-to-image ratio so that the full 10 cm (3.9 in.) wide graticule may be viewed on the 9.7 cm (3.8 in.) film. This is accomplished by making the effective distance from lens to film 0.9 of that from the lens to the display. This distance can be adjusted to give a 1:1 or 1:0.7 ratio.

8-35. BLOCK DIAGRAM DESCRIPTION.

GENERAL. The 197B block diagram is in figure 8-5. The electronic circuitry of the 197B provides graticule illumination and regulates shutter speed.

GRATICULE ILLUMINATION. An unregulated power supply on the A1 board provides +150 and -150 volts to ultraviolet light board A3 for graticule illumination.

SHUTTER SPEED CONTROL. Shutter speed is controlled by a monostable multivibrator (A2U2) whose output pulse width is determined by resistor/capacitor combinations selected by the SHUTTER SPEED **1** switch. The output of A2U2 drives the shutter solenoid control circuit into saturation, activating the shutter solenoid, and opening the shutter.

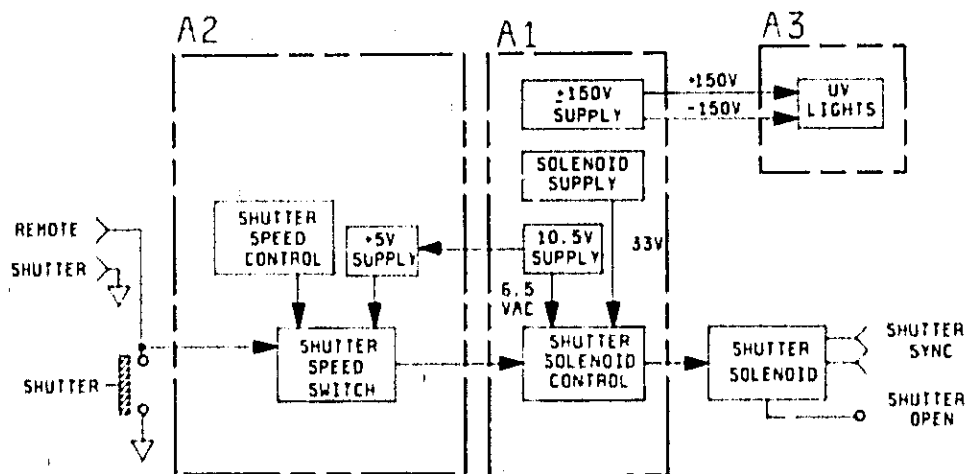


Figure 8-5. 197B Block Diagram

8-36. SERVICE SHEET 1. DETAILED CIRCUIT DESCRIPTIONS.

GENERAL. The following paragraphs provide detailed descriptions of the 197B electronic circuits. Component locators for the circuit boards are in figures 8-6 (A1), 8-7 (A2), and 8-8 (A3). The schematic is in figure 8-9.

POWER SUPPLIES. AC power is applied through the line select switch to power transformer T1. S1 connects the primary windings of T1 in parallel for 115 V operation and in series for 230 V operation.

The secondary windings provide power for three dc power supplies: unregulated +150 and -150 volts for ultraviolet illumination (A1CR7/C5 and A1CR8/C6), unregulated 35 volts to drive the shutter solenoid (A1C3/CR3/CR4), and unregulated 10.5 volts for the +5 volt supply on A2 (A1C1/CR1/CR2/C2).

SHUTTER SPEED CONTROL. The shutter speed control circuit consists of monostable multivibrator A2U2, SHUTTER SPEED switch A2S1, resistor-pack A2U1, and transistor A2Q1.

A negative-going transition from the SHUTTER switch or from a remote connection sets the output of A2U2 (pin 6) high. The output pulse width of A2U2 is determined by the resistor/capacitor combination selected by SHUTTER SPEED ①. For example, when 2 (1/2 second) is selected, the 4.66 k ohm resistor is connected to U2, pin 11 and A2C7 is connected in parallel with A2C5 across pins 10 and 11 of A2U2. With the

relationship $T_w \approx 0.7 RC$ the output pulse width will be approximately 1/2 second.

$$0.7 \times 4.66 \text{ k ohm} \times (150 \text{ UF} + 0.05 \text{ UF}) = 0.489 \text{ second}$$

T (time exposure) control transistor A2Q1 is connected to A2U2, pin 11 in T. The first negative transition from the shutter switch sets A2U2, pin 6 to high saturating A2Q1 because of the positive base drive through A2R3. With A2Q1 saturated, the RC inputs to A2U2, pin 11 are shorted to ground and the output is held high. The next negative transition from the shutter switch turns A2Q1 off, removing the ground from A2U2, pin 11, and allowing A2U2 to reset approximately 60 milliseconds later.

In B (bulb) the output of A2U2 is held high as long as the shutter switch input is held low. In B, CR1 connects the low (ground) input from the shutter switch to A2U2, pin 11, holding the output high. After the shutter input is released, the ground is removed, and A2U2 will reset in approximately 1 millisecond.

SHUTTER SOLENOID CONTROL. A high output from A2U2 applied to the base of A1Q1 causes A1Q1 and A1Q2 to saturate supplying a ground path to the shutter solenoid L1. When L1 is activated, the shutter is opened, the SHUTTER SYNC ① outputs are shorted, and the SHUTTER OPEN ② light is on. When A2U2 resets, A1Q1 and A1Q2 turn off, allowing an internal spring to close the shutter. Before the shutter can be activated again, A1C4 must recharge. The charging time is determined by A1R3 and A1C4 (approximately 2 seconds). A1VR1 provides over voltage protection to the shutter control solenoid L1.

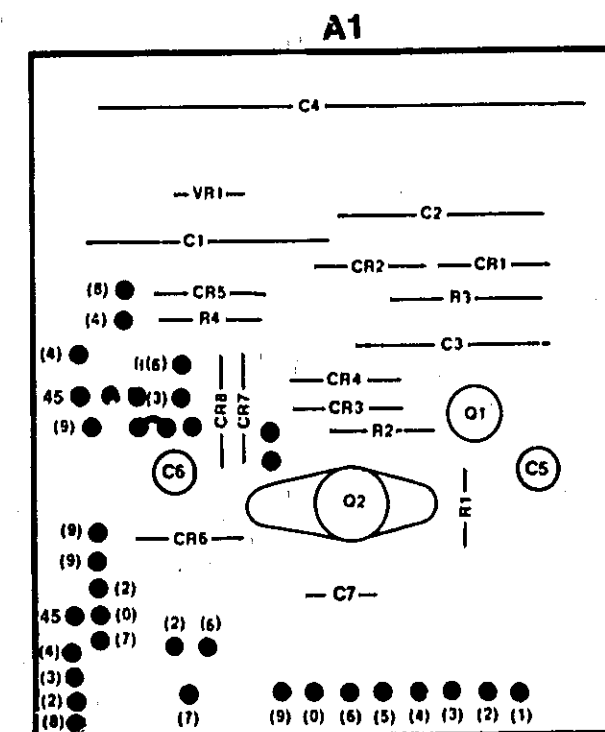


Figure 8-6. A1 Component Locator

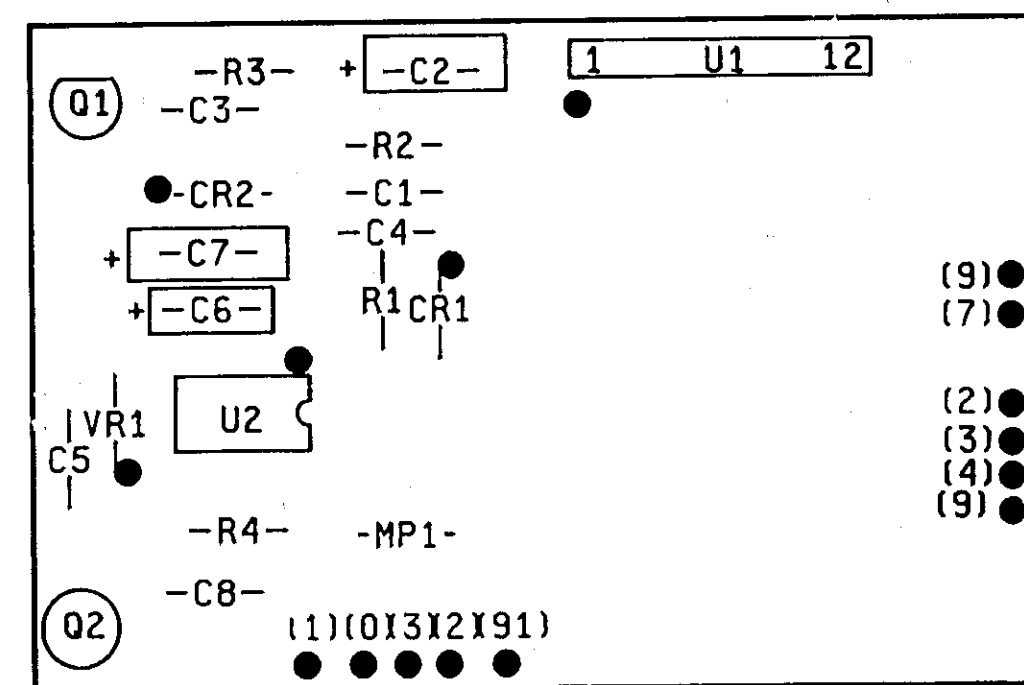


Figure 8-7. A2 Component Locator

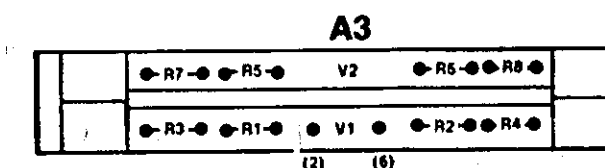
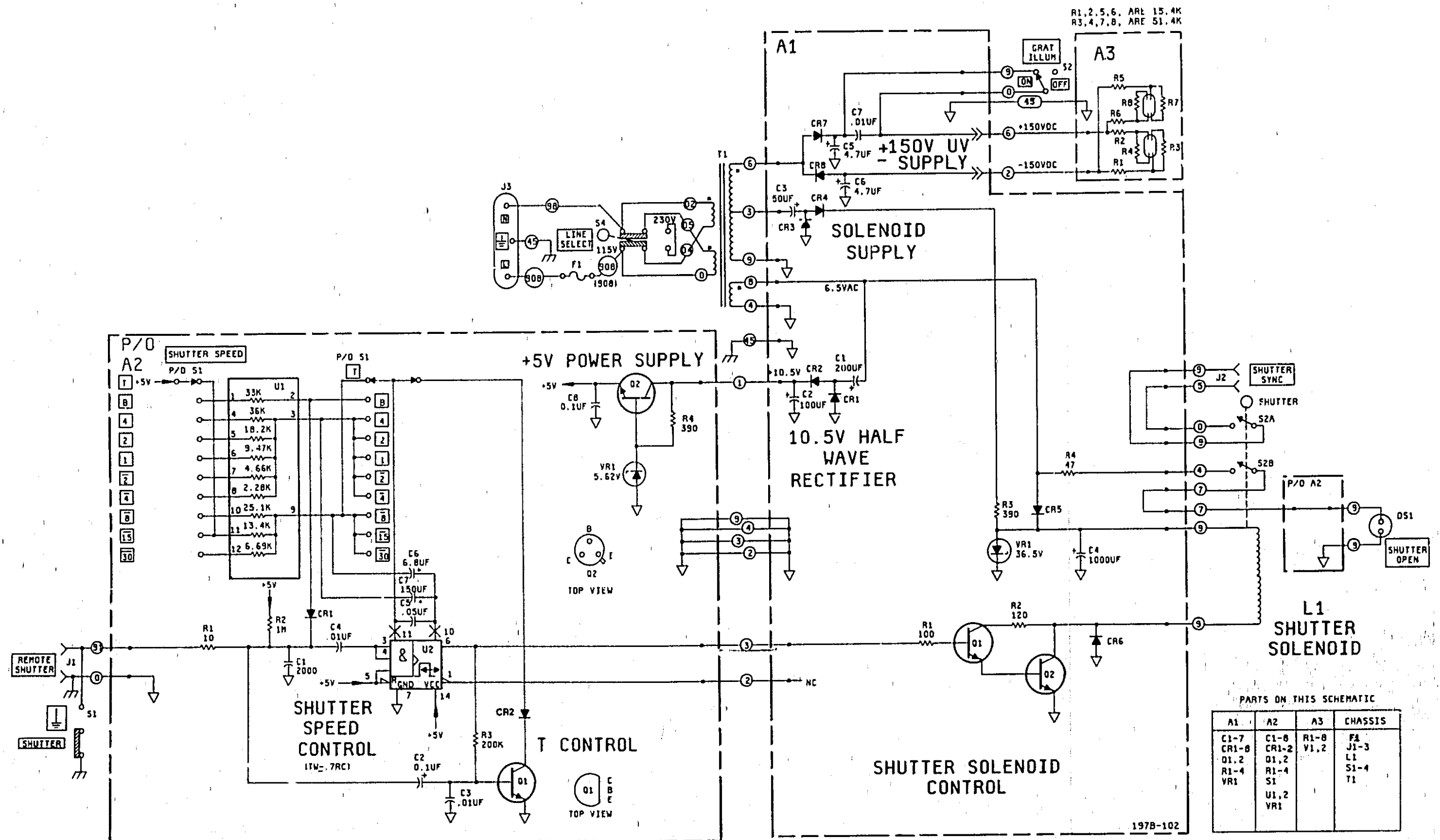


Figure 8-8. A3 Component Locator



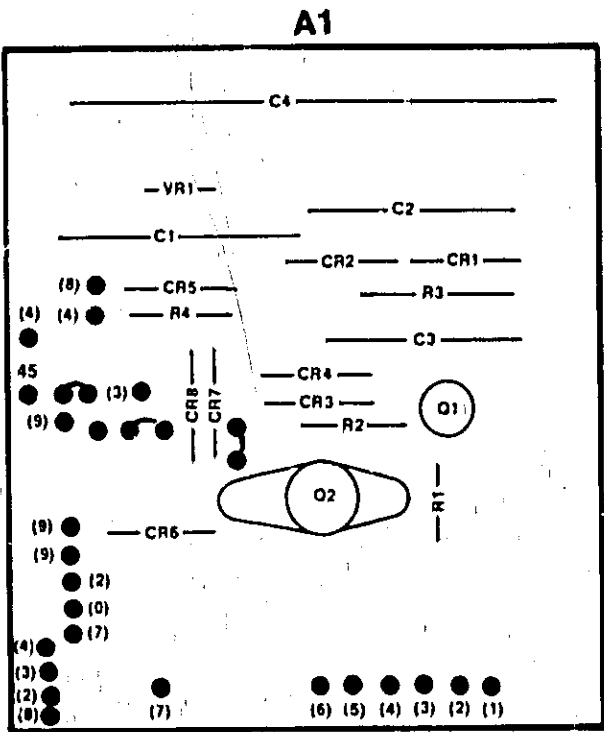


Figure 8-10. A1 Component Locator (Option 001)

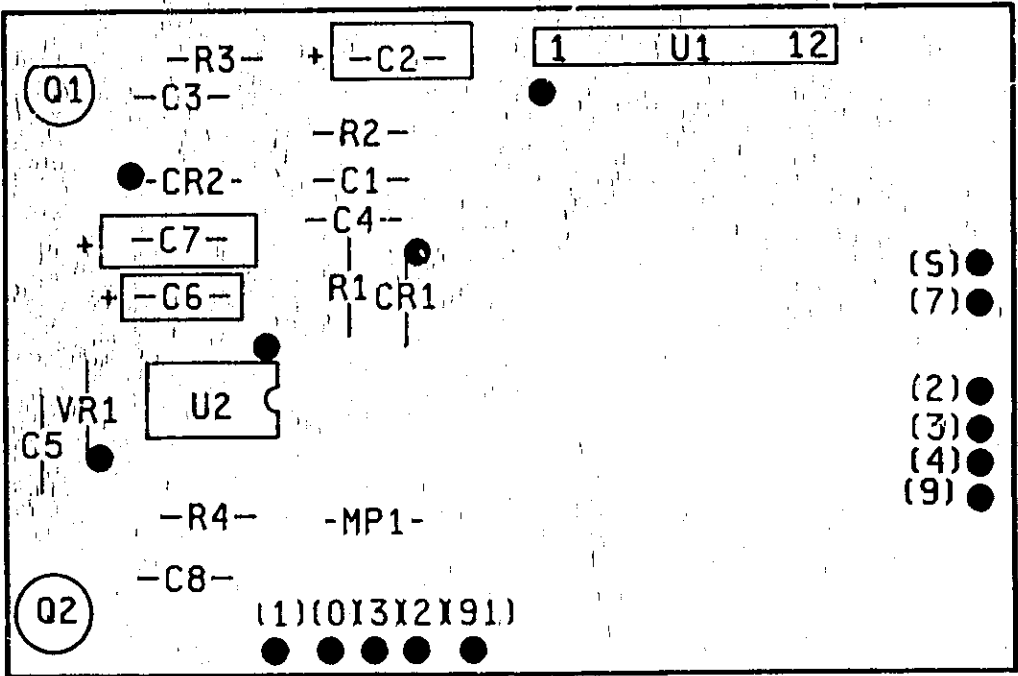


Figure 8-11. A2 Component Locator (Option 001)

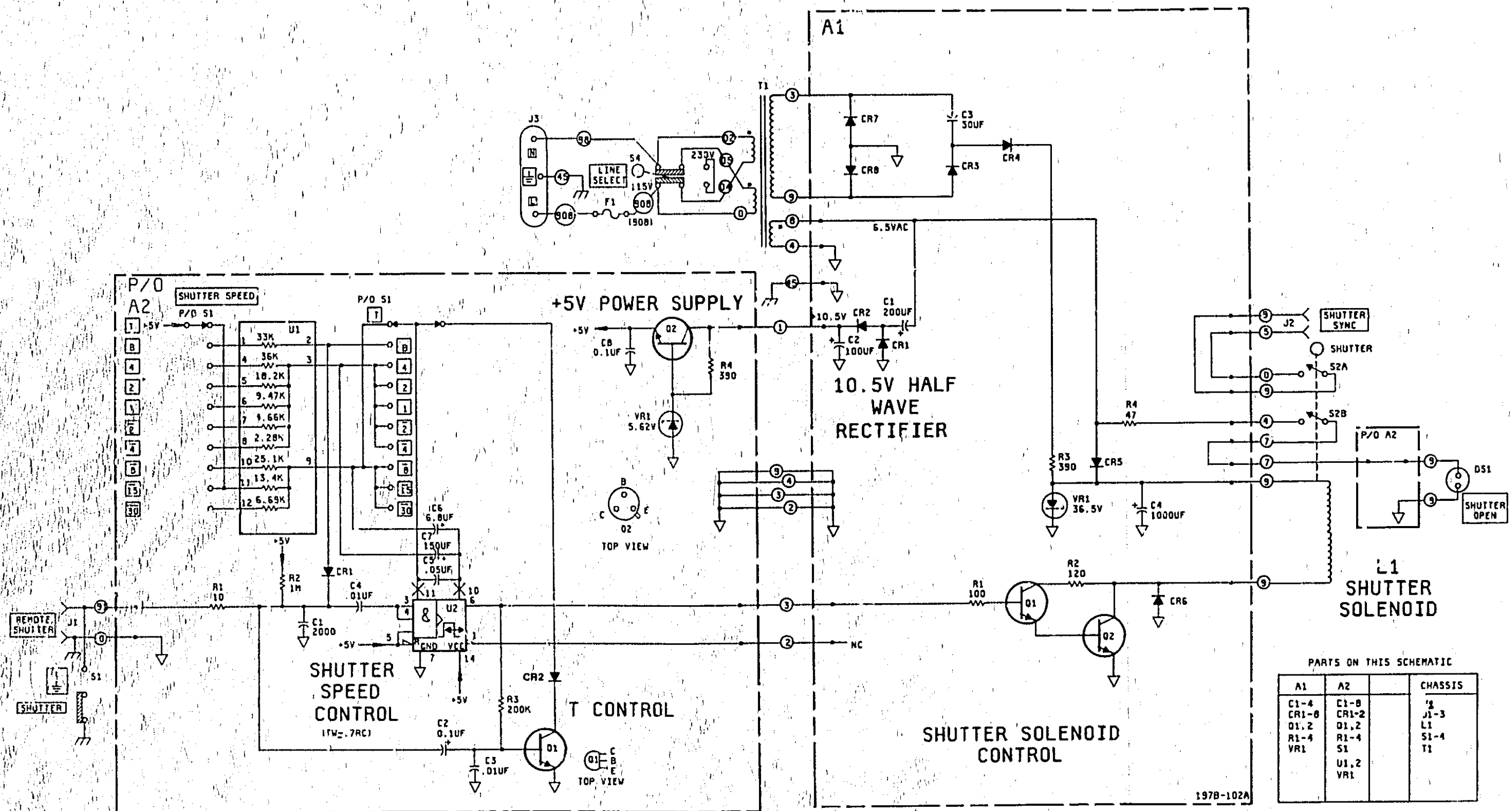
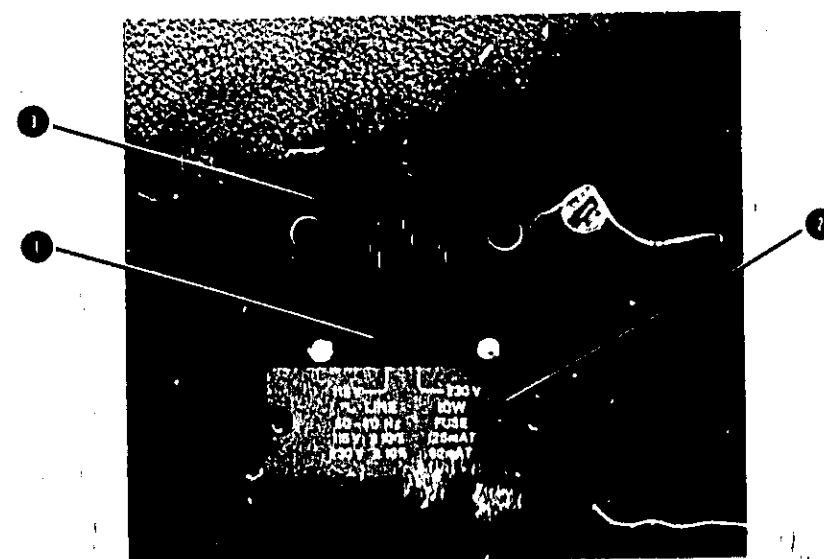
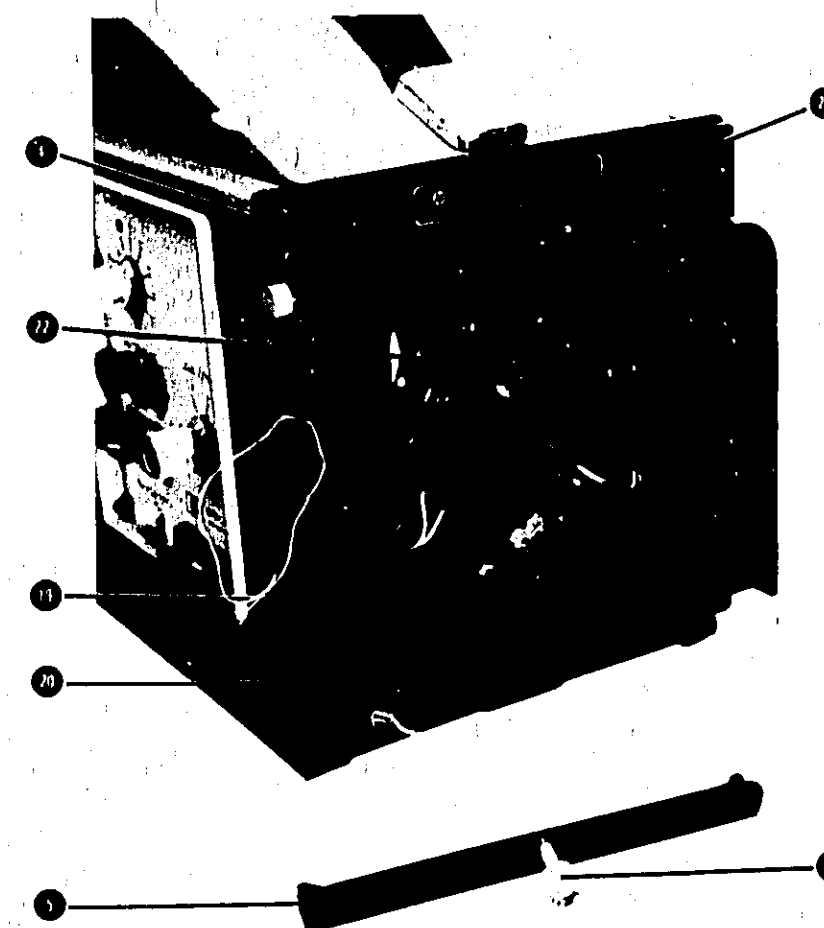


Figure 8-12.
Model 197B (Option 001) Schematic
8-11/(8-12 blank)

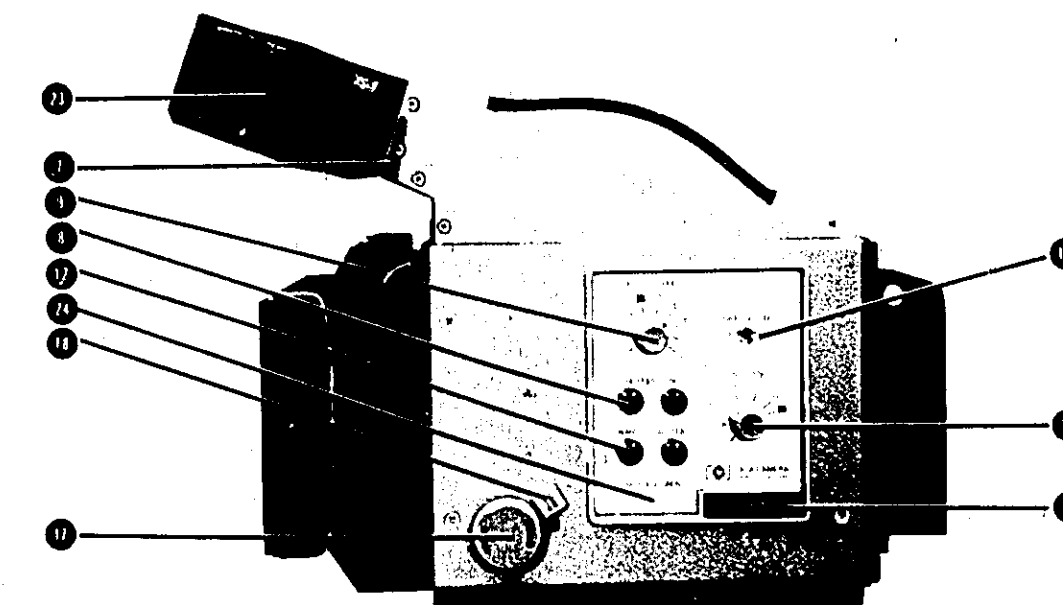
- ① Power Selector Switch
- ② Side Panel Label
- ③ Power Plug
- ④ Standard Front Mount Adapter
- ⑤ Locking Plate
- ⑥ Thumb Screw
- ⑦ Viewer Lever
- ⑧ Shutter Sync Jacks
- ⑨ Shutter Speed Switch
- ⑩ Shutter Bar
- ⑪ Lens f/No. Control
- ⑫ Remote Shutter Jacks
- ⑬ Toggle Switch
- ⑭ Focus Plate
- ⑮ Focus Plate Scales
- ⑯ Focus Plate Storage Compartment
- ⑰ Focus Control
- ⑱ Focus Lock Knob
- ⑲ Front of Right-hand Cover
- ⑳ Left Side of Camera Front
- ㉑ Right Side of Camera Front
- ㉒ Front of Left-hand Cover
- ㉓ Viewer Door
- ㉔ Shutter Open Light



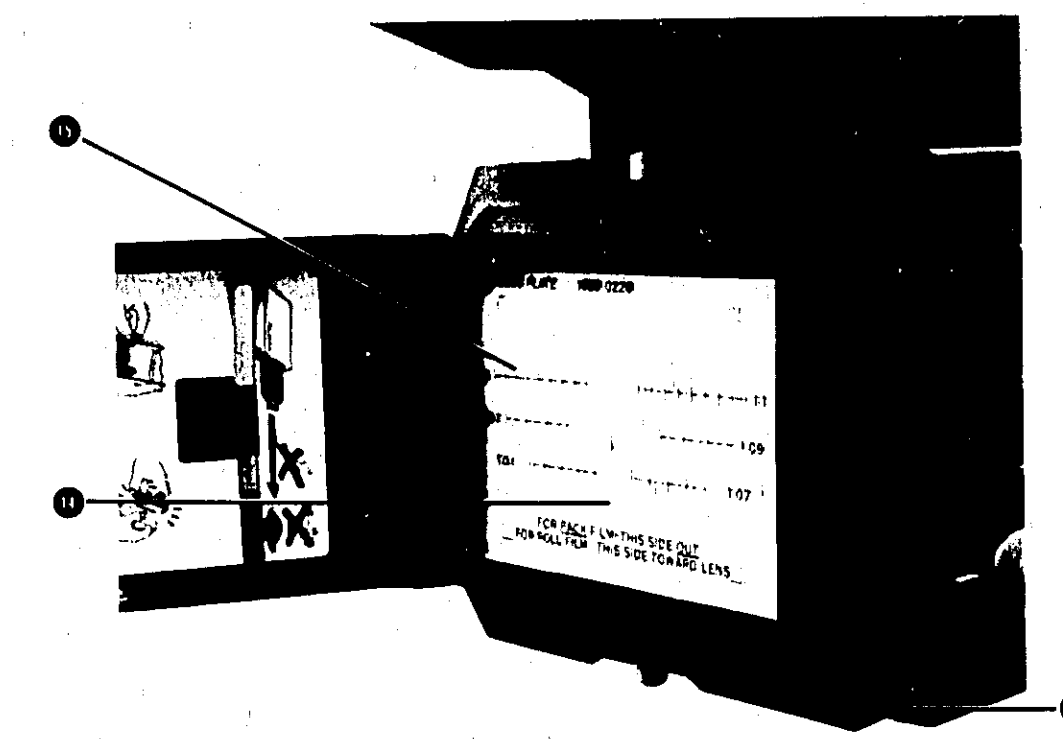
Camera Power Panel



Camera Front View



Camera Control Panel



Camera Back

Figure 8-13.
All Exterior Camera Views
8-13

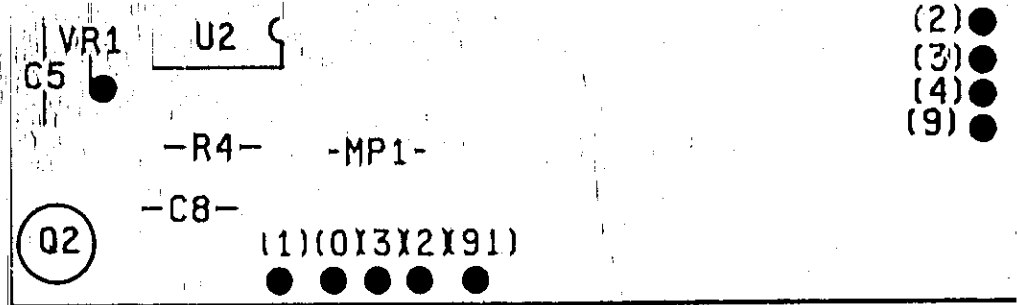


Figure 8-11. A2 Component Locator (Option 001)